

**NOTES ON INTERNET AND WEB TECHNOLOGY**

**5<sup>TH</sup> SEMESTER(DIP)**

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# **Syllabus of Internet and Web Development**

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#### **Coverage of Syllabus upto Internal Exams (I.A.) Chapter 1,2,3,4**

<b>Books Recommended:- Sl.No</b>	<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Name of the Publisher</b>
01	Neha Dutta, Adesh Pandey	Internet and Web Designing	Katson Books
02	Sisodia	Internet & Web page Design	BPB Publication
03	U.K Roy	Web Technologies	Oxford Univ.Press

## **1.0 INTERNET BASICS**

**A computer network is a system in which multiple computers are connected to each other to share information and resources. The most common resource shared today is connection to the Internet. The Internet itself can be considered a computer network.**

### **Characteristics of a Computer Network**

- **Share resources from one computer to another.**
- **Create files and store them in one computer, access those files from the other computer(s) connected over the network.**
- **Connect a printer, scanner, or a fax machine to one computer within the network and let other computers of the network use the machines available over the network.**

**Following is the list of hardware's required to set up a computer network.**

- **Network Cables**
- **Distributors**
- **Routers**
- **Internal Network Cards**
- **External Network Cards**

### **Network Cables**

**Network cables are used to connect computers. The most commonly used cable is Category 5 cable RJ-45.**

### **Distributors**

**A computer can be connected to another one via a serial port but if we need to connect many computers to produce a network, this serial connection will not work.**

**The solution is to use a central body to which other computers, printers, scanners, etc. can be connected and then this body will manage or distribute network traffic.**

### **Router**

**A router is a type of device which acts as the central point among computers and other devices that are a part of the network. It is equipped with holes called ports. Computers and other devices are connected to a router using network cables. Now-a-days router comes in wireless modes using which computers can be connected without any physical cable.**

### **Network Card**

**Network card is a necessary component of a computer without which a computer cannot be connected over a network. It is also known as the network adapter or Network Interface Card (NIC). Most branded computers have network card pre-installed. Network cards are of two types: Internal and External Network Cards.**

### **Internal Network Cards**

**Motherboard has a slot for internal network card where it is to be inserted. Internal network cards are of two types in which the first type uses Peripheral Component Interconnect (PCI) connection, while the second type uses Industry Standard Architecture (ISA). Network cables are required to provide network access.**

### **External Network Cards**

**External network cards are of two types: Wireless and USB based. Wireless network card needs to be inserted into the motherboard, however no network cable is required to connect to the network.**

### **Universal Serial Bus (USB)**

**USB card is easy to use and connects via USB port. Computers automatically detect USB card and can install the drivers required to support the USB network card automatically.**

### **Computer Network Types**

**A computer network is a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data, and applications.**

**A computer network can be categorized by their size. A computer network is mainly of four types:**

- **LAN(Local Area Network)**
- **PAN(Personal Area Network)**
- **MAN(Metropolitan Area Network)**
- **WAN(Wide Area Network)**

### **LAN(Local Area Network)**

- **Local Area Network is a group of computers connected to each other in a small area such as building, office.**
- **LAN is used for connecting two or more personal computers through a communication medium such as twisted pair, coaxial cable, etc.**
- **It is less costly as it is built with inexpensive hardware such as hubs, network adapters, and ethernet cables.**

- **The data is transferred at an extremely faster rate in Local Area Network.**
- **Local Area Network provides higher security.**

### **PAN(Personal Area Network)**

- **Personal Area Network is a network arranged within an individual person, typically within a range of 10 meters.**
- **Personal Area Network is used for connecting the computer devices of personal use is known as Personal Area Network.**
- **Thomas Zimmerman was the first research scientist to bring the idea of the Personal Area Network.**
- **Personal Area Network covers an area of 30 feet.**
- **Personal computer devices that are used to develop the personal area network are the laptop, mobile phones, media player and play stations.**

**There are two types of Personal Area Network:**

- **Wired Personal Area Network**
- **Wireless Personal Area Network**

**Wireless Personal Area Network: Wireless Personal Area Network is developed by simply using wireless technologies such as WiFi, Bluetooth. It is a low range network.**

**Wired Personal Area Network: Wired Personal Area Network is created by using the USB.**

**Examples Of Personal Area Network:**

- **Body Area Network: Body Area Network is a network that moves with a person. For example, a mobile network moves with a person. Suppose a person establishes a network connection and then creates a connection with another device to share the information.**
- **Offline Network: An offline network can be created inside the home, so it is also known as a home network. A home network is designed to integrate the devices such as printers, computer, television but they are not connected to the internet.**
- **Small Home Office: It is used to connect a variety of devices to the internet and to a corporate network using a VPN**

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### **MAN(Metropolitan Area Network)**

- **A metropolitan area network is a network that covers a larger geographic area by interconnecting a different LAN to form a larger network.**

- **Government agencies use MAN to connect to the citizens and private industries.**
- **In MAN, various LANs are connected to each other through a telephone exchange line.**
- **The most widely used protocols in MAN are RS-232, Frame Relay, ATM, ISDN, OC-3, ADSL, etc.**
- **It has a higher range than Local Area Network(LAN).**

#### **Uses Of Metropolitan Area Network:**

- **MAN is used in communication between the banks in a city.**
- **It can be used in an Airline Reservation.**
- **It can be used in a college within a city.**
- **It can also be used for communication in the military.**

#### **WAN(Wide Area Network)**

- **A Wide Area Network is a network that extends over a large geographical area such as states or countries.**
- **A Wide Area Network is quite bigger network than the LAN.**
- **A Wide Area Network is not limited to a single location, but it spans over a large geographical area through a telephone line, fibre optic cable or satellite links.**
- **The internet is one of the biggest WAN in the world.**
- **A Wide Area Network is widely used in the field of Business, government, and education.**

#### **Examples Of Wide Area Network:**

- **Mobile Broadband: A 4G network is widely used across a region or country.**
- **Last mile: A telecom company is used to provide the internet services to the customers in hundreds of cities by connecting their home with fiber.**
- **Private network: A bank provides a private network that connects the 44 offices. This network is made by using the telephone leased line provided by the telecom company.**

#### **Internetwork**

- **An internetwork is defined as two or more computer network LANs or WAN or computer network segments are connected using devices, and they are configured by a local addressing scheme. This process is known as internetworking.**
- **An interconnection between public, private, commercial, industrial, or government computer networks can also be defined as internetworking.**

- **An internetworking uses the internet protocol.**
- **The reference model used for internetworking is Open System Interconnection(OSI).**

### **Types Of Internetwork:**

**1. Extranet:** An extranet is a communication network based on the internet protocol such as Transmission Control protocol and internet protocol. It is used for information sharing. The access to the extranet is restricted to only those users who have login credentials. An extranet is the lowest level of internetworking. It can be categorized as MAN, WAN or other computer networks. An extranet cannot have a single LAN, atleast it must have one connection to the external network.

**2. Intranet:** An intranet is a private network based on the internet protocol such as Transmission Control protocol and internet protocol. An intranet belongs to an organization which is only accessible by the organization's employee or members. The main aim of the intranet is to share the information and resources among the organization employees. An intranet provides the facility to work in groups and for teleconferences.

### **Intranet advantages:**

- **Communication:** It provides a cheap and easy communication. An employee of the organization can communicate with another employee through email, chat.
- **Time-saving:** Information on the intranet is shared in real time, so it is time-saving.
- **Collaboration:** Collaboration is one of the most important advantage of the intranet. The information is distributed among the employees of the organization and can only be accessed by the authorized user.
- **Platform independency:** It is a neutral architecture as the computer can be connected to another device with different architecture.
- **Cost effective:** People can see the data and documents by using the browser and distributes the duplicate copies over the intranet. This leads to a reduction in the cost.

### **What is Topology?**

**Topology** defines the structure of the network of how all the components are interconnected to each other. There are two types of topology: physical and logical topology.

**Physical topology** is the geometric representation of all the nodes in a network.

### **Bus Topology**

- **The bus topology is designed in such a way that all the stations are connected through a single cable known as a backbone cable.**
- **Each node is either connected to the backbone cable by drop cable or directly connected to the backbone cable.**
- **When a node wants to send a message over the network, it puts a message over the network. All the stations available in the network will receive the message whether it has been addressed or not.**
- **The bus topology is mainly used in 802.3 (ethernet) and 802.4 standard networks.**
- **The configuration of a bus topology is quite simpler as compared to other topologies.**
- **The backbone cable is considered as a "single lane" through which the message is broadcast to all the stations.**
- **The most common access method of the bus topologies is CSMA (Carrier Sense Multiple Access).**
- **CSMA: It is a media access control used to control the data flow so that data integrity is maintained, i.e., the packets do not get lost. There are two alternative ways of handling the problems that occur when two nodes send the messages simultaneously.**
- **CSMA CD: CSMA CD (Collision detection) is an access method used to detect the collision. Once the collision is detected, the sender will stop transmitting the data. Therefore, it works on "recovery after the collision".**
- **CSMA CA: CSMA CA (Collision Avoidance) is an access method used to avoid the collision by checking whether the transmission media is busy or not. If busy, then the sender waits until the media becomes idle. This technique effectively reduces the possibility of the collision. It does not work on "recovery after the collision".**

#### **Advantages of Bus topology:**

- **Low-cost cable: In bus topology, nodes are directly connected to the cable without passing through a hub. Therefore, the initial cost of installation is low.**
- **Moderate data speeds: Coaxial or twisted pair cables are mainly used in bus-based networks that support upto 10 Mbps.**
- **Familiar technology: Bus topology is a familiar technology as the installation and troubleshooting techniques are well known, and hardware components are easily available.**
- **Limited failure: A failure in one node will not have any effect on other nodes.**

### **Disadvantages of Bus topology:**

- **Extensive cabling:** A bus topology is quite simpler, but still it requires a lot of cabling.
- **Difficult troubleshooting:** It requires specialized test equipment to determine the cable faults. If any fault occurs in the cable, then it would disrupt the communication for all the nodes.
- **Signal interference:** If two nodes send the messages simultaneously, then the signals of both the nodes collide with each other.
- **Reconfiguration difficult:** Adding new devices to the network would slow down the network.
- **Attenuation:** Attenuation is a loss of signal leads to communication issues. Repeaters are used to regenerate the signal.

### **Ring Topology**

- **Ring topology is like a bus topology, but with connected ends.**
- **The node that receives the message from the previous computer will retransmit to the next node.**
- **The data flows in one direction, i.e., it is unidirectional.**
- **The data flows in a single loop continuously known as an endless loop.**
- **It has no terminated ends, i.e., each node is connected to other node and having no termination point.**
- **The data in a ring topology flow in a clockwise direction.**
- **The most common access method of the ring topology is token passing.**
  - **Token passing:** It is a network access method in which token is passed from one node to another node.
  - **Token:** It is a frame that circulates around the network.

### **Working of Token passing**

- **A token moves around the network, and it is passed from computer to computer until it reaches the destination.**
- **The sender modifies the token by putting the address along with the data.**
- **The data is passed from one device to another device until the destination address matches. Once the token received by the destination device, then it sends the acknowledgment to the sender.**
- **In a ring topology, a token is used as a carrier.**

### **Advantages of Ring topology:**

- **Network Management:** Faulty devices can be removed from the network without bringing the network down.
- **Product availability:** Many hardware and software tools for network operation and monitoring are available.
- **Cost:** Twisted pair cabling is inexpensive and easily available. Therefore, the installation cost is very low.
- **Reliable:** It is a more reliable network because the communication system is not dependent on the single host computer.

### **Disadvantages of Ring topology:**

- **Difficult troubleshooting:** It requires specialized test equipment to determine the cable faults. If any fault occurs in the cable, then it would disrupt the communication for all the nodes.
- **Failure:** The breakdown in one station leads to the failure of the overall network.
- **Reconfiguration difficult:** Adding new devices to the network would slow down the network.
- **Delay:** Communication delay is directly proportional to the number of nodes. Adding new devices increases the communication delay.

### **Star Topology**

- **Star topology** is an arrangement of the network in which every node is connected to the central hub, switch or a central computer.
- The central computer is known as a server, and the peripheral devices attached to the server are known as clients.
- Coaxial cable or RJ-45 cables are used to connect the computers.
- Hubs or Switches are mainly used as connection devices in a physical star topology.
- Star topology is the most popular topology in network implementation.

### **Advantages of Star topology**

- **Efficient troubleshooting:** Troubleshooting is quite efficient in a star topology as compared to bus topology. In a bus topology, the manager has to inspect the kilometers of cable. In a star topology, all the stations are connected to the centralized network. Therefore, the network administrator has to go to the single station to troubleshoot the problem.
- **Network control:** Complex network control features can be easily implemented in the star topology. Any changes made in the star topology are automatically accommodated.

- **Limited failure:** As each station is connected to the central hub with its own cable, therefore failure in one cable will not affect the entire network.
- **Familiar technology:** Star topology is a familiar technology as its tools are cost-effective.
- **Easily expandable:** It is easily expandable as new stations can be added to the open ports on the hub.
- **Cost effective:** Star topology networks are cost-effective as it uses inexpensive coaxial cable.
- **High data speeds:** It supports a bandwidth of approx 100Mbps. Ethernet 100BaseT is one of the most popular Star topology networks.

#### **Disadvantages of Star topology**

- **A Central point of failure:** If the central hub or switch goes down, then all the connected nodes will not be able to communicate with each other.
- **Cable:** Sometimes cable routing becomes difficult when a significant amount of routing is required.

#### **Tree topology**

- **Tree topology combines the characteristics of bus topology and star topology.**
- **A tree topology is a type of structure in which all the computers are connected with each other in hierarchical fashion.**
- **The top-most node in tree topology is known as a root node, and all other nodes are the descendants of the root node.**
- **There is only one path exists between two nodes for the data transmission. Thus, it forms a parent-child hierarchy.**

#### **Advantages of Tree topology**

- **Support for broadband transmission:** Tree topology is mainly used to provide broadband transmission, i.e., signals are sent over long distances without being attenuated.
- **Easily expandable:** We can add the new device to the existing network. Therefore, we can say that tree topology is easily expandable.
- **Easily manageable:** In tree topology, the whole network is divided into segments known as star networks which can be easily managed and maintained.
- **Error detection:** Error detection and error correction are very easy in a tree topology.
- **Limited failure:** The breakdown in one station does not affect the entire network.
- **Point-to-point wiring:** It has point-to-point wiring for individual segments.

### **Disadvantages of Tree topology**

- **Difficult troubleshooting:** If any fault occurs in the node, then it becomes difficult to troubleshoot the problem.
- **High cost:** Devices required for broadband transmission are very costly.
- **Failure:** A tree topology mainly relies on main bus cable and failure in main bus cable will damage the overall network.
- **Reconfiguration difficult:** If new devices are added, then it becomes difficult to reconfigure.

### **Mesh topology**

- **Mesh technology** is an arrangement of the network in which computers are interconnected with each other through various redundant connections.
- There are multiple paths from one computer to another computer.
- It does not contain the switch, hub or any central computer which acts as a central point of communication.
- The Internet is an example of the mesh topology.
- Mesh topology is mainly used for WAN implementations where communication failures are a critical concern.
- Mesh topology is mainly used for wireless networks.
- Mesh topology can be formed by using the formula:  
Number of cables =  $(n*(n-1))/2$ ;

Where n is the number of nodes that represents the network.

Mesh topology is divided into two categories:

- **Fully connected mesh topology**
- **Partially connected mesh topology**
- **Full Mesh Topology:** In a full mesh topology, each computer is connected to all the computers available in the network.
- **Partial Mesh Topology:** In a partial mesh topology, not all but certain computers are connected to those computers with which they communicate frequently.

**Advantages of Mesh topology:**

**Reliable:** The mesh topology networks are very reliable as if any link breakdown will not affect the communication between connected computers.

**Fast Communication:** Communication is very fast between the nodes.

**Easier Reconfiguration:** Adding new devices would not disrupt the communication between other devices.

#### **Disadvantages of Mesh topology**

- **Cost:** A mesh topology contains a large number of connected devices such as a router and more transmission media than other topologies.
- **Management:** Mesh topology networks are very large and very difficult to maintain and manage. If the network is not monitored carefully, then the communication link failure goes undetected.
- **Efficiency:** In this topology, redundant connections are high that reduces the efficiency of the network.

#### **Hybrid Topology**

- The combination of various different topologies is known as Hybrid topology.
- A Hybrid topology is a connection between different links and nodes to transfer the data.
- When two or more different topologies are combined together is termed as Hybrid topology and if similar topologies are connected with each other will not result in Hybrid topology. For example, if there exist a ring topology in one branch of ICICI bank and bus topology in another branch of ICICI bank, connecting these two topologies will result in Hybrid topology.

#### **Advantages of Hybrid Topology**

- **Reliable:** If a fault occurs in any part of the network will not affect the functioning of the rest of the network.
- **Scalable:** Size of the network can be easily expanded by adding new devices without affecting the functionality of the existing network.
- **Flexible:** This topology is very flexible as it can be designed according to the requirements of the organization.
- **Effective:** Hybrid topology is very effective as it can be designed in such a way that the strength of the network is maximized and weakness of the network is minimized.

#### **Disadvantages of Hybrid topology**

- **Complex design:** The major drawback of the Hybrid topology is the design of the Hybrid network. It is very difficult to design the architecture of the Hybrid network.

- **Costly Hub:** The Hubs used in the Hybrid topology are very expensive as these hubs are different from usual Hubs used in other topologies.
- **Costly infrastructure:** The infrastructure cost is very high as a hybrid network requires a lot of cabling, network devices, etc.

## **Internet**

**Internet refers to network of networks. In this network each computer is recognized by a globally unique address known as IP address. A special computer DNS (Domain Name Server) is used to give name to the IP Address so that user can locate a computer by a name.**

**For example, a DNS server will resolve a name <http://www.tutorialspoint.com> to a particular IP address to uniquely identify the computer on which this website is hosted.**

- **Internet is a world-wide global system of interconnected computer networks.**
- **Internet uses the standard Internet Protocol (TCP/IP).**
- **Every computer in internet is identified by a unique IP address.**
- **IP Address is a unique set of numbers (such as 110.22.33.114) which identifies a computer location.**
- **A special computer DNS (Domain Name Server) is used to give name to the IP Address so that user can locate a computer by a name.**
- **For example, a DNS server will resolve a name <http://www.tutorialspoint.com> to a particular IP address to uniquely identify the computer on which this website is hosted.**
- **Internet is accessible to every user all over the world.**

## **Evolution**

**The concept of Internet was originated in 1969 and has undergone several technological & Infrastructural changes as discussed below:**

- **The origin of Internet devised from the concept of Advanced Research Project Agency Network (ARPANET).**
- **ARPANET was developed by United States Department of Defense.**
- **Basic purpose of ARPANET was to provide communication among the various bodies of government.**
- **Initially, there were only four nodes, formally called Hosts.**
- **In 1972, the ARPANET spread over the globe with 23 nodes located at different countries and thus became known as Internet.**

- **By the time, with invention of new technologies such as TCP/IP protocols, DNS, WWW, browsers, scripting languages etc.,Internet provided a medium to publish and access information over the web.**

## **Advantages**

**Internet covers almost every aspect of life, one can think of. Here, we will discuss some of the advantages of Internet:**

- **Internet allows us to communicate with the people sitting at remote locations. There are various apps available on the web that uses Internet as a medium for communication. One can find various social networking sites such as:**
  - **Facebook**
  - **Twitter**
  - **Yahoo**
  - **Google+**
  - **Flickr**
  - **Orkut**
- **One can surf for any kind of information over the internet. Information regarding various topics such as Technology, Health & Science, Social Studies, Geographical Information, Information Technology, Products etc can be surfed with help of a search engine.**
- **Apart from communication and source of information, internet also serves a medium for entertainment. Following are the various modes for entertainment over internet.**
  - **Online Television**
  - **Online Games**
  - **Songs**
  - **Videos**
  - **Social Networking Apps**
- **Internet allows us to use many services like:**
  - **Internet Banking**
  - **Matrimonial Services**
  - **Online Shopping**
  - **Online Ticket Booking**
  - **Online Bill Payment**
  - **Data Sharing**

- E-mail
- Internet provides concept of electronic commerce, that allows the business deals to be conducted on electronic systems

### **Disadvantages**

However, Internet has proved to be a powerful source of information in almost every field, yet there exists many disadvantages discussed below:

- There are always chances to lose personal information such as name, address, credit card number. Therefore, one should be very careful while sharing such information. One should use credit cards only through authenticated sites.
- Another disadvantage is the Spamming. Spamming corresponds to the unwanted e-mails in bulk. These e-mails serve no purpose and lead to obstruction of entire system.
- Virus can easily be spread to the computers connected to internet. Such virus attacks may cause your system to crash or your important data may get deleted.
- Also a biggest threat on internet is pornography. There are many pornographic sites that can be found, letting your children to use internet which indirectly affects the children healthy mental life.
- There are various websites that do not provide the authenticated information. This leads to misconception among many people.

### **Intranet**

Intranet is defined as private network of computers within an organization with its own server and firewall. Moreover we can define Intranet as:

- Intranet is system in which multiple PCs are networked to be connected to each other. PCs in intranet are not available to the world outside of the intranet.
- Usually each company or organization has their own Intranet network and members/employees of that company can access the computers in their intranet.
- Every computer in internet is identified by a unique IP address.
- Each computer in Intranet is also identified by a IP Address, which is unique among the computers in that Intranet.

### **Benefits**

Intranet is very efficient and reliable network system for any organization. It is beneficial in every aspect such as collaboration, cost-effectiveness, security, productivity and much more.

## **Communication**

**Intranet offers easy and cheap communication within an organization. Employees can communicate using chat, e-mail or blogs.**

## **Time Saving**

**Information on Intranet is shared in real time.**

## **Collaboration**

**Information is distributed among the employees as according to requirement and it can be accessed by the authorized users, resulting in enhanced teamwork.**

## **Platform Independency**

**Intranet can connect computers and other devices with different architecture.**

## **Cost Effective**

**Employees can see the data and other documents using browser rather than printing them and distributing duplicate copies among the employees, which certainly decreases the cost.**

## **Workforce Productivity**

**Data is available at every time and can be accessed using company workstation. This helps the employees work faster.**

## **Business Management**

**It is also possible to deploy applications that support business operations.**

## **Security**

**Since information shared on intranet can only be accessed within an organization, therefore there is almost no chance of being theft.**

## **Specific Users**

**Intranet targets only specific users within an organization therefore, once can exactly know whom he is interacting.**

## **Immediate Updates**

**Any changes made to information are reflected immediately to all the users.**

## **Issues**

**Apart from several benefits of Intranet, there also exist some issues.. These issues are shown in the following diagram:**

## **Applications**

**Intranet applications are same as that of Internet applications. Intranet applications are also accessed through a web browser. The only difference is that, Intranet applications reside on local server while Internet applications reside on remote server. Here, we've discussed some of these applications:**

#### **Document publication applications**

**Document publication applications allow publishing documents such as manuals, software guide, employee profits etc without use of paper.**

#### **Electronic resources applications**

**It offers electronic resources such as software applications, templates and tools, to be shared across the network.**

#### **Interactive Communication applications**

**Like on internet, we have e-mail and chat like applications for Intranet, hence offering an interactive communication among employees.**

#### **Support for Internet Applications**

**Intranet offers an environment to deploy and test applications before placing them on Internet.**

#### **Internet vs. Intranet**

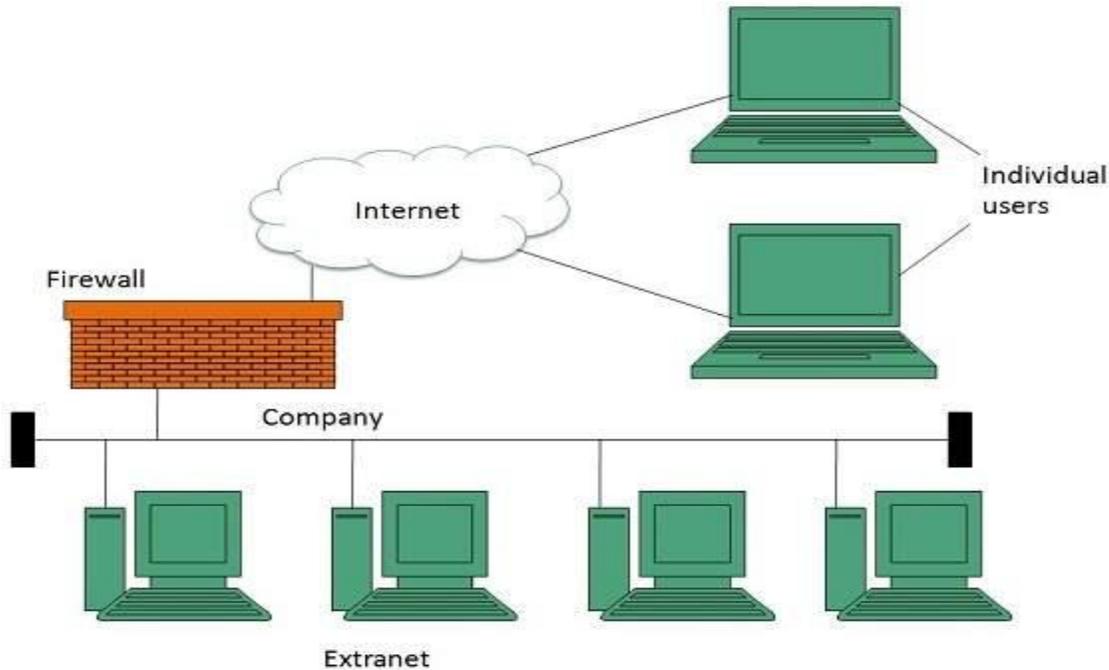
**Apart from similarities there are some differences between the two. Following are the differences between Internet and Intranet:**

<b>Intranet</b>	<b>Internet</b>
<b>Localized Network.</b>	<b>Worldwide Network</b>
<b>Doesn't have access to Intranet</b>	<b>Have access to Internet.</b>
<b>More Expensive</b>	<b>Less Expensive</b>
<b>More Safe</b>	<b>Less Safe</b>

<b>More Reliability</b>	<b>Less Reliability</b>
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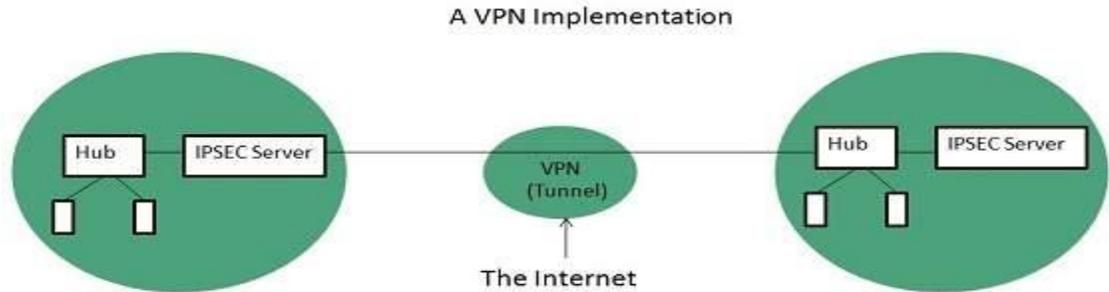
**Extranet**

Extranet refers to network within an organization, using internet to connect to the outsiders in controlled manner. It helps to connect businesses with their customers and suppliers and therefore allows working in a collaborative manner.



**Implementation**

Extranet is implemented as a Virtual Private Networks (VPN) because it uses internet to connect to corporate organization and there is always a threat to information security. VPN offers a secure network in public infrastructure (Internet).

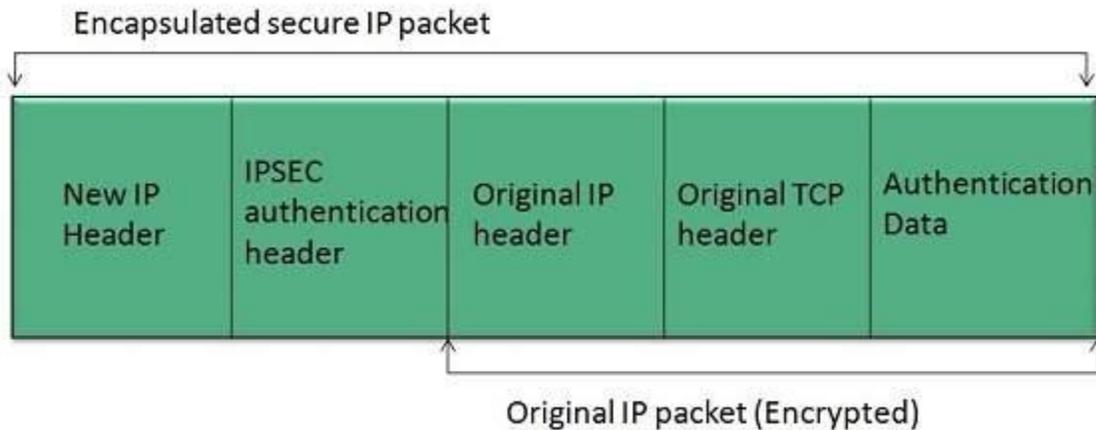


**Key Points**

- The packet is encapsulated at boundary of networks in IPSEC complaint routers.

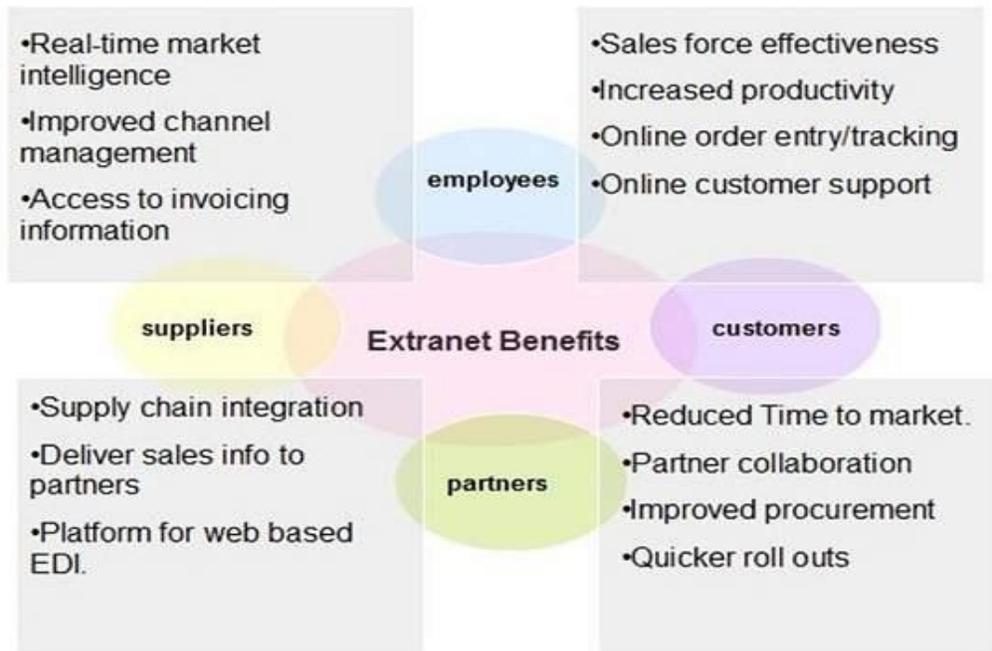
- It uses an encryption key to encapsulate packets and IP addresses as well.
- The packet is decoded only by the IPSEC compliant routers or servers.
- The message is sent over VPN via VPN Tunnel and this process is known as tunneling.

VPN uses Internet Protocol Security Architecture (IPSEC) Protocol to provide secure transactions by adding an additional security layer to TCP/IP protocol. This layer is created by encapsulating the IP packet to a new IP packet as shown in the following diagram:



### Benefits

Extranet proves to be a successful model for all kind of businesses whether small or big. Here are some of the advantages of extranet for employees, suppliers, business partners, and customers:



## Issues

Apart for advantages there are also some issues associated with extranet. These issues are discussed below:

### Hosting

Where the extranet pages will be held i.e. who will host the extranet pages. In this context there are two choices:

- Host it on your own server.
- Host it with an Internet Service Provider (ISP) in the same way as web pages.

But hosting extranet pages on your own server requires high bandwidth internet connection which is very costly.

### Security

Additional firewall security is required if you host extranet pages on your own server which result in a complex security mechanism and increase work load.

### Accessing Issues

Information can not be accessed without internet connection. However, information can be accessed in Intranet without internet connection.

### Decreased Interaction

It decreases the face to face interaction in the business which results in lack of communication among customers, business partners and suppliers.

## Extranet vs. Intranet

The following table shows differences between Extranet and Intranet:

Extranet	Intranet
Internal network that can be accessed externally.	Internal network that can not be accessed externally.
Extranet is extension of company's Intranet.	Only limited users of a company.
For limited external communication between customers, suppliers and business partners.	Only for communication within a company.

## Connection to Internet:

**ISP(Internet Service Provider):** It is a company or an organization which provide access to the Internet. Some method of provide this service is dialup telephone Cable or high speed wireless connectivityex:- BSNL (Bharat Sanchar Nigam limited)

MTNL(Mahanagar Telephone Nigam Limited)

## Internet Services :

- E-learning
- E-commerce
- News – group
- Chart room
- Online –Banking
- E-mail
- Interactive digital communication
- Advertising
- Online games and musics
- E-magazine and paper and E-books

## Advantages of Internet:

- Find any type of information with the help of search engine
- Buy and sell goods over the Internet

- Pay bills , read news papersand send greetings
- Download songs movies and play games
- Fill-online forms
- Buy the tickets
- Chat with friend and relatives
- Easily search and read books

**Dis advantages:**

- **Virus Threat**(At the time of accessing Internet good chances of virus attack
- **Hacking**
- **Loss of personal Information** may a major drawback of Internet
- **Continuous uae of the Internet** is bad for ones mental ability.

## **MODEM**

**Modem.** Modem is short for "Modulator-Demodulator." It is a hardware component that allows a computer or another device, such as a router or switch, to connect to the Internet. It converts or "modulates" an analog signal from a telephone or cable wire to digital data (1s and 0s) that a computer can recognize.

A modem is a device that connects your home, usually through a coax cable connection, to your Internet service provider (ISP), like Xfinity. The modem takes signals from your ISP and translates them into signals your local devices can use, and vice versa.

### **The Best Cable Modem**

- **Our pick. Motorola MB7621.** The best modem for most people. Compatible with the most ISPs, the MB7621 supports Internet plans up to 600 Mbps. ...
- **Runner-up. Netgear CM600.** Same speeds, shorter warranty. ...
- **Budget pick. Netgear CM500.** For plans up to 300 Mbps. ...
- **Upgrade pick. Motorola MB8600.** For gigabit Internet plans.

**There are two types of modems: i) Internal Modem ii) External Modem**

**i) Internal Modem:** An internal Modem is a device fixed inside the computer.

**Ex:** Dial-up modem and wifi are internal modems.

**Dial-up modem** operates over a telephone line. It requires a network access phone number, user name and password to make a connection.

**Wifi**(Wireless Fidelity ) is a popular technology used to access the Internet without telephone line. It enables the computer to exchange the data wirelessly (using radio waves)over a network.

**Ex:**Data card and USB interface

**ii) External Modem : Connects to the computer via a cable and is placed on your desk. External modems are more expensive than internal modems.**

## **Internet Reference Models**

### **Reference Model**

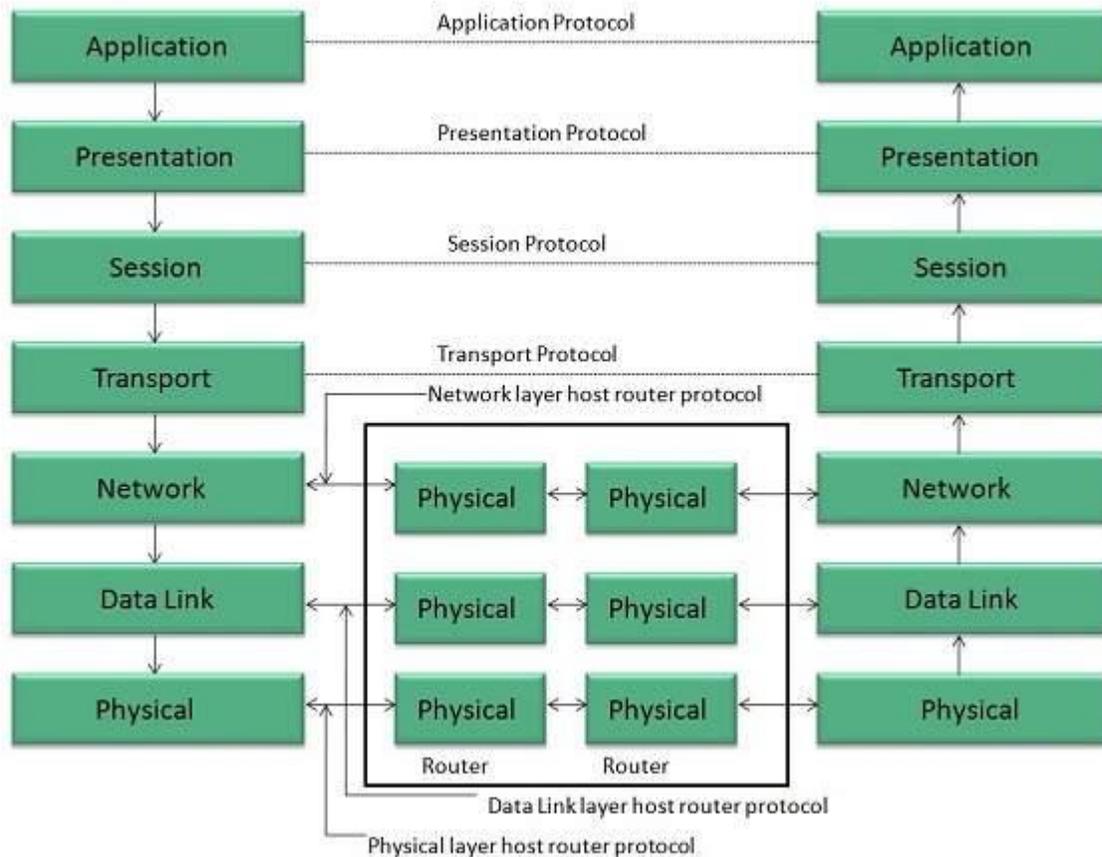
**Reference Model offers a means of standardization which is acceptable worldwide. Since people using the computer network are located over a wide physical range and their network devices might have heterogeneous architecture. In order to provide communication among heterogeneous devices, we need a standardized model i.e. a reference model, which would provide us way how these devices can communicate regardless their architecture.**

**We have two reference models such as OSI model and TCP/IP reference model, however, the OSI model is a hypothetical one but the TCP/IP is absolutely practical model.**

### **OSI Model**

**OSI is acronym of Open System Interface. This model is developed by the International organization of Standardization (ISO) and therefore also referred as ISO-OSI Model.**

**The OSI model consists of seven layers as shown in the following diagram. Each layer has a specific function, however each layer provide services to the layer above.**



## Physical Layer

The Physical layer is responsible for the following activities:

- Activating, maintaining and deactivating the physical connection.
- Defining voltages and data rates needed for transmission.
- Converting digital bits into electrical signal.
- Deciding whether the connection is simplex, half duplex or full duplex.

## Data Link Layer

The data link layer performs the following functions:

- Performs synchronization and error control for the information which is to be transmitted over the physical link.
- Enables error detection, and adds error detection bits to the data which are to be transmitted.

## Network Layer

Following are the functions of Network Layer:

- To route the signals through various channels to the other end.

- **To act as the network controller by deciding which route data should take.**
- **To divide the outgoing messages into packets and to assemble incoming packets into messages for higher levels.**

### **Transport Layer**

**The Transport layer performs the following functions:**

- **It decides if the data transmission should take place on parallel paths or single path.**
- **It performs multiplexing, splitting on the data.**
- **It breaks the data groups into smaller units so that they are handled more efficiently by the network layer.**

**The Transport Layer guarantees transmission of data from one end to other end.**

### **Session Layer**

**The Session layer performs the following functions:**

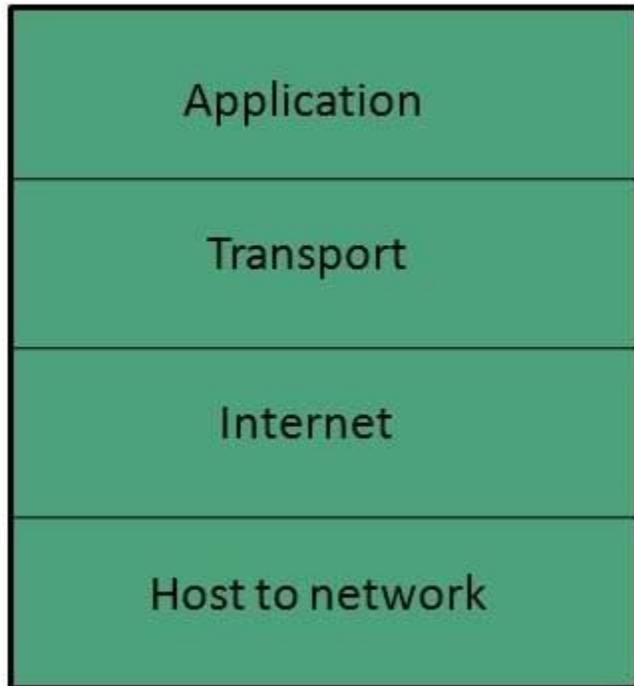
- **Manages the messages and synchronizes conversations between two different applications.**
- **It controls logging on and off, user identification, billing and session management.**

### **Presentation Layer**

**The Presentation layer performs the following functions:**

- **This layer makes it sure that the information is delivered in such a form that the receiving system will understand and use it.**

## TCP/IP Model



### Application Layer

The Application layer performs the following functions:

- It provides different services such as manipulation of information in several ways, retransferring the files of information, distributing the results etc.
- The functions such as LOGIN or password checking are also performed by the application layer.

### TCP/IP Model

TCP/IP model is practical model and is used in the Internet. TCP/IP is acronym of Transmission Control Protocol and Internet Protocol.

The TCP/IP model combines the two layers (Physical and Data link layer) into one layer i.e. Host-to-Network layer. The following diagram shows the various layers of TCP/IP model:

### Application Layer

This layer is same as that of the OSI model and performs the following functions:

- It provides different services such as manipulation of information in several ways, retransferring the files of information, distributing the results etc.
- The functions such as LOGIN or password checking are also performed by the application layer.

**Protocols used:** TELNET, FTP, SMTP, DN, HTTP, NNTP are the protocols employed in this layer.

### Transport Layer

It does the same functions as that of transport layer in OSI model. Here are the key points regarding transport layer:

- It uses TCP and UDP protocol for end to end transmission.
- TCP is reliable and connection oriented protocol.
- TCP also handles flow control.
- The UDP is not reliable and a connection less protocol also does not perform flow control.

**Protocols used:** TCP/IP and UDP protocols are employed in this layer.

### Internet Layer

The function of this layer is to allow the host to insert packets into network and then make them travel independently to the destination. However, the order of receiving the packet can be different from the sequence they were sent.

**Protocols used:** Internet Protocol (IP) is employed in Internet layer.

### Host-to-Network Layer

This is the lowest layer in TCP/IP model. The host has to connect to network using some protocol, so that it can send IP packets over it. This protocol varies from host to host and network to network.

**Protocols used:** ARPANET, SATNET, LAN, packet radio are the protocols which are used in this layer.

### IP address:

Every computer in **internet** is identified by a unique **IP address**. **IP Address** is a unique set of numbers (such as 110.22. 33.114) which identifies a computer location. A special computer DNS (Domain Name **Server**) is used to give name to the **IP Address** so that user can locate a computer by a name.

**Explanation:**IP (Internet Protocol) Address is an address of your network hardware. It helps in connecting your computer to other devices on your network and all over the world. An IP Address is made up of numbers or characters.

An example of an IP address would be: 506.457.14.512

All devices that are connected to an internet connection have a unique IP address which means there's a need of billions of IP addresses. This requirement is fulfilled by the new IP version IPv6.

There are two IP versions: IPv4 and IPv6. IPv4 is the older version which has a space of over 4 billion IP addresses. However, the new IPv6 version can provide up to trillions of IP addresses to fulfill the need of all internet users and devices.

The IPv4 version used to configure IP addresses in numerical value (numbers) which may conflict with other IP addresses. That's why IPv6 adopted the hexadecimal method to provide unique IP addresses to billions of users in the world.

Example of an IPv6 IP address would be: 4ggr:1925:5656:7:600:t4tt:tc54:98vt

There are a few types of IP addresses like private IP addresses, public IP addresses, static IP addresses and dynamic IP addresses. Let's talk about these different types of IP addresses one by one:

### **Private IP Address**

A private IP address is the address of your device connected on the home or business network. If you have a few different devices connected to one ISP (Internet Service Provider), then all your devices will have a unique private IP address. This IP address cannot be accessed from devices outside your home or business network.

For example: 192.168.1.1

Private IP addresses are not unique because there are limited number of devices on your network.

You can find out the private IP address of your device using a few techniques. If you are a Windows user, then simply go to the command prompt and enter the command *ipconfig*. If you're a mac users, then you need to enter the following command *ifconfig* in your Terminal app

If you are using the internet on a mobile phone, then you can go to your WiFi settings to find out the IP address. iOS users can find the IP address by clicking on the 'i' button next to the network they are connected to. Android users can click on the network name in their WiFi settings, and it will show the IP address.

### **Public IP Address**

Your public IP address is the main IP address to which your home or business network is connected. This IP address connects you to the world, and it's unique for all users.

To find out your public IP address, simply go to [SupportAlly](#) site in your browser, and it will display the public IP, and other browser information.

## Static and Dynamic IP Addresses

All private and public IP addresses can be either static or dynamic. IP addresses that you configure manually and fix them to the network of your device are called static IP addresses. Static IP addresses cannot change automatically.

The dynamic IP address configures automatically and assign an IP to your network when you set up the router with internet. This distribution of IP addresses is managed by Dynamic Host Configuration Protocol (DHCP). DHCP can be your internet router that assigns an IP address to your network in your home or business environment.

When **DNS** was not into existence, one had to download a **Host file** containing host names and their corresponding IP address. But with increase in number of hosts of internet, the size of host file also increased. This resulted in increased traffic on downloading this file. To solve this problem the DNS system was introduced.

**Domain Name System** helps to resolve the host name to an address. It uses a hierarchical naming scheme and distributed database of IP addresses and associated names

### IP Address

IP address is a unique logical address assigned to a machine over the network. An IP address exhibits the following properties:

- IP address is the unique address assigned to each host present on Internet.
- IP address is 32 bits (4 bytes) long.
- IP address consists of two components: **network component** and **host component**.
- Each of the 4 bytes is represented by a number from 0 to 255, separated with dots. For example 137.170.4.124

IP address is 32-bit number while on the other hand domain names are easy to remember names. For example, when we enter an email address we always enter a symbolic string such as `webmaster@tutorialspoint.com`.

### Uniform Resource Locator (URL)

**Uniform Resource Locator (URL)** refers to a web address which uniquely identifies a document over the internet.

This document can be a web page, image, audio, video or anything else present on the web.

For example, `www.tutorialspoint.com/internet_technology/index.html` is an URL to the `index.html` which is stored on tutorialspoint web server under `internet_technology` directory.

### URL Types

There are two forms of URL as listed below:

- Absolute URL
- Relative URL

### Absolute URL

Absolute URL is a complete address of a resource on the web. This completed address comprises of protocol used, server name, path name and file name.

For example `http://www.tutorialspoint.com/internet_technology/index.htm`.where:

- **http** is the protocol.
- **tutorialspoint.com** is the server name.
- **index.htm** is the file name.

The protocol part tells the web browser how to handle the file. Similarly we have some other protocols also that can be used to create URL are:

- FTP
- https
- Gopher
- mailto
- news

### Relative URL

Relative URL is a partial address of a webpage. Unlike absolute URL, the protocol and server part are omitted from relative URL.

Relative URLs are used for internal links i.e. to create links to file that are part of same website as the WebPages on which you are placing the link.

For example, to link an image on `tutorialspoint.com/internet_technology/internet_referemce_models`, we can use the relative URL which can take the form like **`/internet_technologies/internet-osi_model.jpg`**.

### Difference between Absolute and Relative URL

Absolute URL	Relative URL
Used to link web pages on different websites	Used to link web pages within the same website.

Difficult to manage.	Easy to Manage
Changes when the server name or directory name changes	Remains same even if we change the server name or directory name.
Take time to access	Comparatively faster to access.

## Domain Name System Architecture

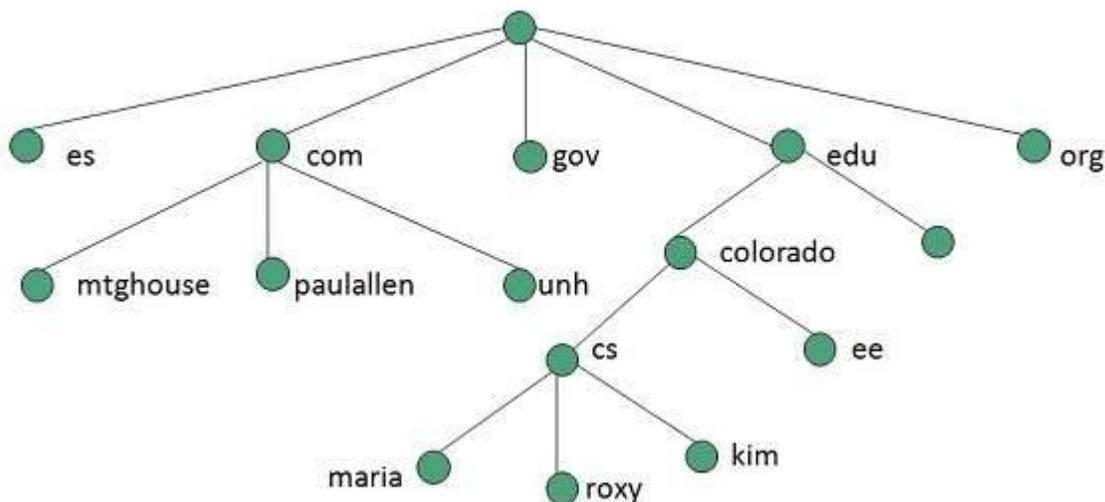
The Domain name system comprises of **Domain Names, Domain Name Space, Name Server** that have been described below:

### Domain Names

Domain Name is a symbolic string associated with an IP address. There are several domain names available; some of them are generic such as **com, edu, gov, net** etc, while some country level domain names such as **au, in, za, us** etc.

### Domain Name Space

The domain name space refers a hierarchy in the internet naming structure. This hierarchy has multiple levels (from 0 to 127), with a root at the top. The following diagram shows the domain name space hierarchy:



In the above diagram each subtree represents a domain. Each domain can be partitioned into sub domains and these can be further partitioned and so on.

## Name Server

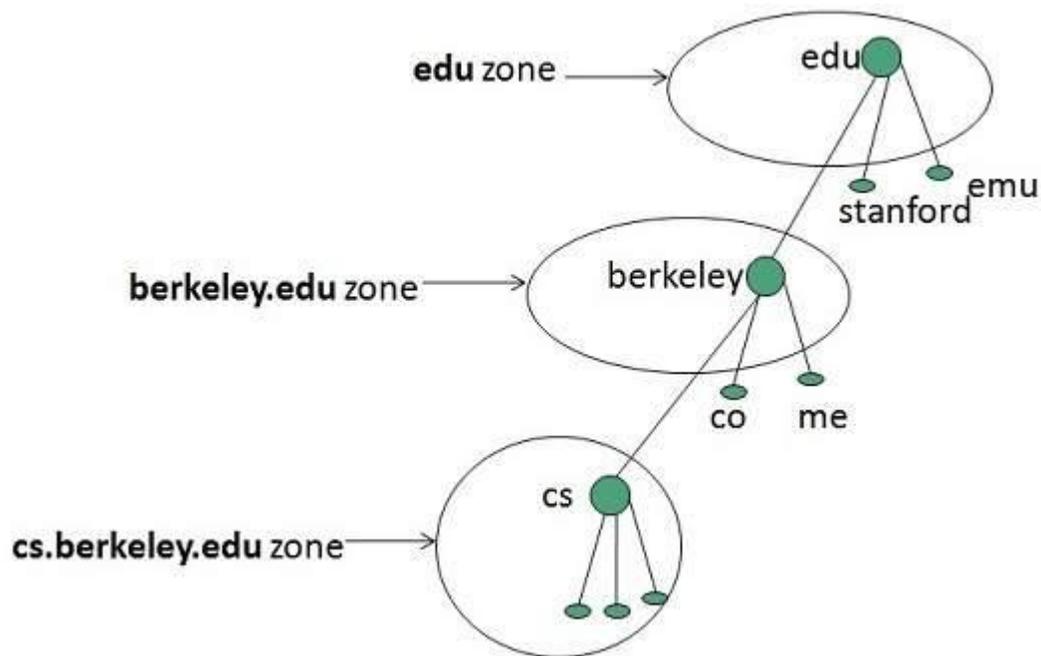
Name server contains the DNS database. This database comprises of various names and their corresponding IP addresses. Since it is not possible for a single server to maintain entire DNS database, therefore, the information is distributed among many DNS servers.

- Hierarchy of server is same as hierarchy of names.
- The entire name space is divided into the zones

## Zones

Zone is collection of nodes (sub domains) under the main domain. The server maintains a database called zone file for every zone.

database called zone file for every zone.



If the domain is not further divided into sub domains then domain and zone refers to the same thing.

The information about the nodes in the sub domain is stored in the servers at the lower levels however; the original server keeps reference to these lower levels of servers.

## Types of Name Servers

Following are the three categories of Name Servers that manages the entire Domain Name System:

- Root Server

- Primary Server
- Secondary Server

### Root Server

Root Server is the top level server which consists of the entire DNS tree. It does not contain the information about domains but delegates the authority to the other server

### Primary Servers

Primary Server stores a file about its zone. It has authority to create, maintain, and update the zone file.

### Secondary Server

Secondary Server transfers complete information about a zone from another server which may be primary or secondary server. The secondary server does not have authority to create or update a zone file.

### DNS Working

DNS translates the domain name into IP address automatically. Following steps will take you through the steps included in domain resolution process:

- When we type **www.nit.com** into the browser, it asks the local DNS Server for its IP address.  
Here the local DNS is at ISP end.
- When the local DNS does not find the IP address of requested domain name, it forwards the request to the root DNS server and again enquires about IP address of it.
- The root DNS server replies with delegation that **I do not know the IP address of www.nit.com but know the IP address of DNS Server.**
- The local DNS server then asks the com DNS Server the same question.
- The **com** DNS Server replies the same that it does not know the IP address of www.tutorialspoint.com but knows the address of tutorialspoint.com.
- Then the local DNS asks the tutorialspoint.com DNS server the same question.
- Then tutorialspoint.com DNS server replies with IP address of www.tutorialspoint.com.
- Now, the local DNS sends the IP address of www.tutorialspoint.com to the computer that sends the request.

### CIDR notation[edit]

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CIDR notation is a compact representation of an IP address and its associated routing prefix. The notation is constructed from an IP address, a slash (/) character, and a decimal number. The trailing number is the count of leading 1 bits in the routing mask, traditionally called the network

mask. The IP address in the notation is always represented according to the standards for IPv4 or IPv6.

The address may denote a single, distinct interface address, or it may be the beginning address of an entire network. When expressing a network, its size is given by the number of addresses that are possible with the number of remaining, least-significant bits below the prefix, i.e. the host identifier.

For example:

- *192.168.100.14/24* represents the IPv4 address *192.168.100.14* and its associated routing prefix *192.168.100.0*, or equivalently, its subnet mask *255.255.255.0*, which has 24 leading 1-bits.
- the IPv4 block *192.168.100.0/22* represents the 1024 IPv4 addresses from *192.168.100.0* to *192.168.103.255*.
- the IPv6 block *2001:db8::/48* represents the block of IPv6 addresses from *2001:db8:0:0:0:0:0:0* to *2001:db8:0:fff:fff:fff:fff:fff*.
- *::1/128* represents the IPv6 loopback address. Its prefix length is 128 which is the number of bits in the address.

For IPv4, CIDR notation is an alternative to the older system of representing networks by their starting address and the subnet mask, both written in dot-decimal notation. *192.168.100.0/24* is equivalent to *192.168.100.0/255.255.255.0*.

The number of addresses of a subnet may be calculated as  $2^{\text{address length} - \text{prefix length}}$ , where *address length* is 128 for IPv6 and 32 for IPv4. For example, in IPv4, the prefix length */29* gives:  $2^{32 - 29} = 2^3 = 8$  addresses.

## Subnet masks

---

A subnet mask is a bitmask that encodes the prefix length associated with an IPv4 address or network in quad-dotted notation: 32 bits, starting with a number of 1 bits equal to the prefix length, ending with 0 bits, and encoded in four-part dotted-decimal format: *255.255.255.0*. A subnet mask encodes the same information as a prefix length but predates the advent of CIDR. In CIDR notation, the prefix bits are always contiguous. Subnet masks were allowed by RFC 950<sup>[5]</sup> to specify non-contiguous bits until RFC 4632: the mask must be left contiguous. Given this constraint, a subnet mask and CIDR notation serve exactly the same function.

## CIDR blocks

---

CIDR is principally a bitwise, prefix-based standard for the representation of IP addresses and their routing properties. It facilitates routing by allowing blocks of addresses to be grouped into single routing table entries. These groups, commonly called CIDR blocks, share an initial sequence of bits in the binary representation of their IP addresses. IPv4 CIDR blocks are identified using a syntax similar to that of IPv4 addresses: a dotted-decimal address, followed by a slash, then a number from 0 to 32, i.e., *a.b.c.d/n*. The dotted decimal portion is the IPv4 address. The number following the slash is the prefix length, the number of shared initial bits, counting from the most-significant bit of the address. When emphasizing only the size of a network, the address portion of the notation is usually omitted. Thus, a */20* block is a CIDR block with an unspecified 20-bit prefix.

An IP address is part of a CIDR block and is said to match the CIDR prefix if the initial  $n$  bits of the address and the CIDR prefix are the same. An IPv4 address is 32 bits so an  $n$ -bit CIDR prefix leaves  $32 - n$  bits unmatched, meaning that  $2^{32 - n}$  IPv4 addresses match a given  $n$ -bit CIDR prefix. Shorter CIDR prefixes match more addresses, while longer prefixes match fewer. In the case of overlaid CIDR blocks, an address can match multiple CIDR prefixes of different lengths.

CIDR is also used for IPv6 addresses and the syntax semantic is identical. The prefix length can range from 0 to 128, due to the larger number of bits in the address. However, by convention, a subnet on broadcast MAC layer networks always has 64-bit host identifiers. Larger prefixes are rarely used even on point-to-point links.

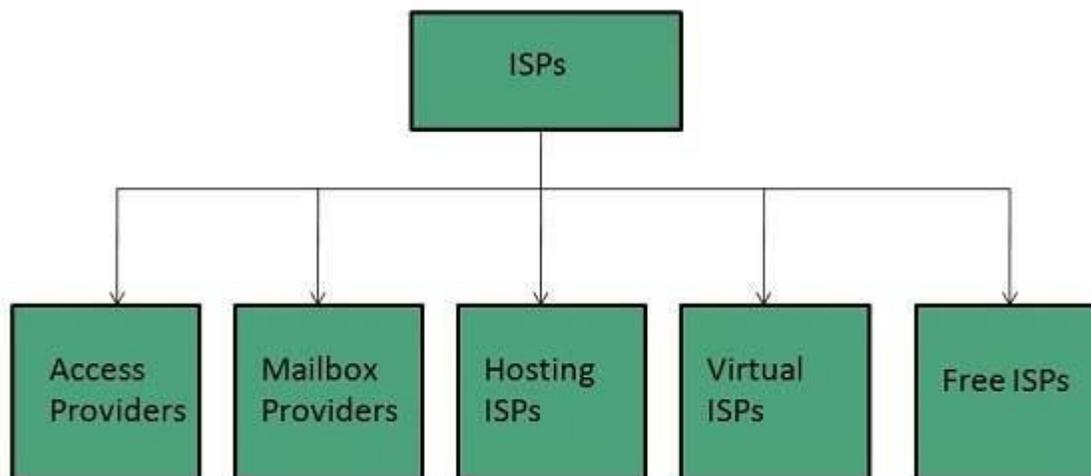
## Internet Service Providers (ISP)

**Internet Service Provider (ISP)** is a company offering access to internet. They offer various services:

- Internet Access
- Domain name registration
- Dial-up access
- Leased line access

## ISP Types

ISPs can broadly be classified into six categories as shown in the following diagram:



### Access providers

They provide access to internet through telephone lines, cable wi-fi or fiber optics.

## Mailbox Provider

Such providers offer mailbox hosting services.

## Hosting ISPs

Hosting ISPs offers e-mail, and other web hosting services such as virtual machines, clouds etc.

## Virtual ISPs

Such ISPs offer internet access via other ISP services.

## Free ISPs

Free ISPs do not charge for internet services.

## Connection Types

There exist several ways to connect to the internet. Following are these connection types available:

1. Dial-up Connection
2. ISDN
3. DSL
4. Cable TV Internet connections
5. Satellite Internet connections
6. Wireless Internet Connections

## Dial-up Connection

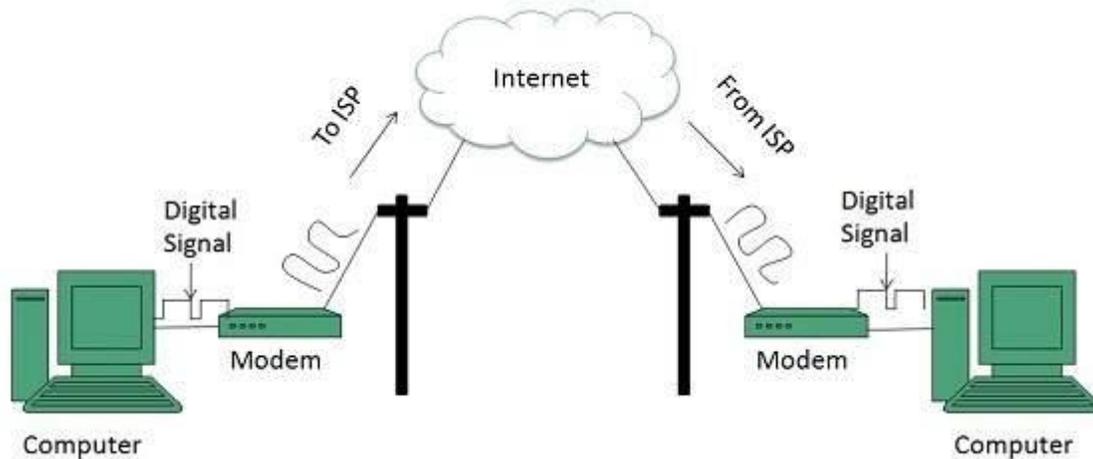
**Dial-up** connection uses telephone line to connect PC to the internet. It requires a modem to setup dial-up connection. This modem works as an interface between PC and the telephone line.

There is also a communication program that instructs the modem to make a call to specific number provided by an ISP.

Dial-up connection uses either of the following protocols:

1. Serial Line Internet Protocol (SLIP)
2. Point to Point Protocol (PPP)

The following diagram shows the accessing internet using modem:



## ISDN

**ISDN** is acronym of **Integrated Services Digital Network**. It establishes the connection using the phone lines which carry digital signals instead of analog signals.

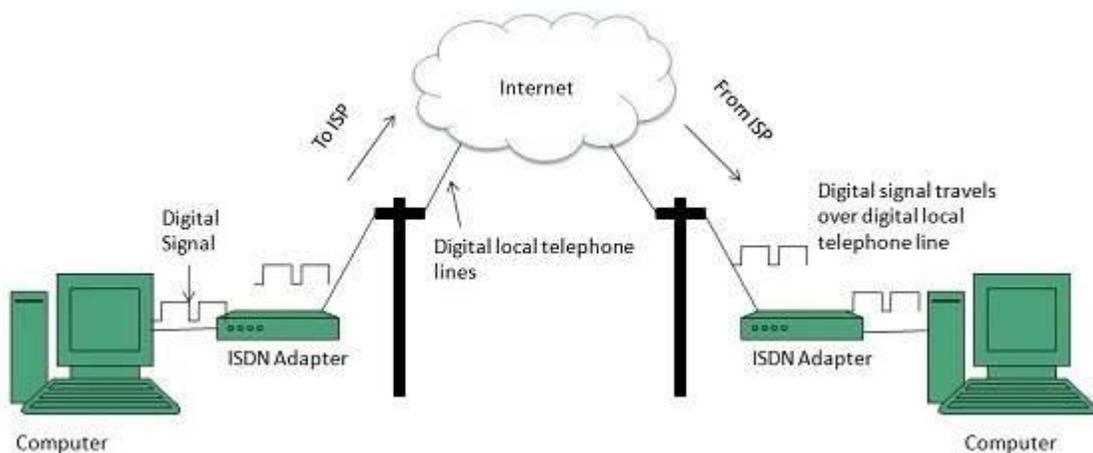
There are two techniques to deliver ISDN services:

1. Basic Rate Interface (BRI)
2. Primary Rate Interface (PRI)

### Key points:

- The BRI ISDN consists of three distinct channels on a single ISDN line: t1o 64kbps B (Bearer) channel and one 16kbps D (Delta or Data) channels.
- The PRI ISDN consists of 23 B channels and one D channels with both have operating capacity of 64kbps individually making a total transmission rate of 1.54Mbps.

The following diagram shows accessing internet using ISDN connection:



## DSL

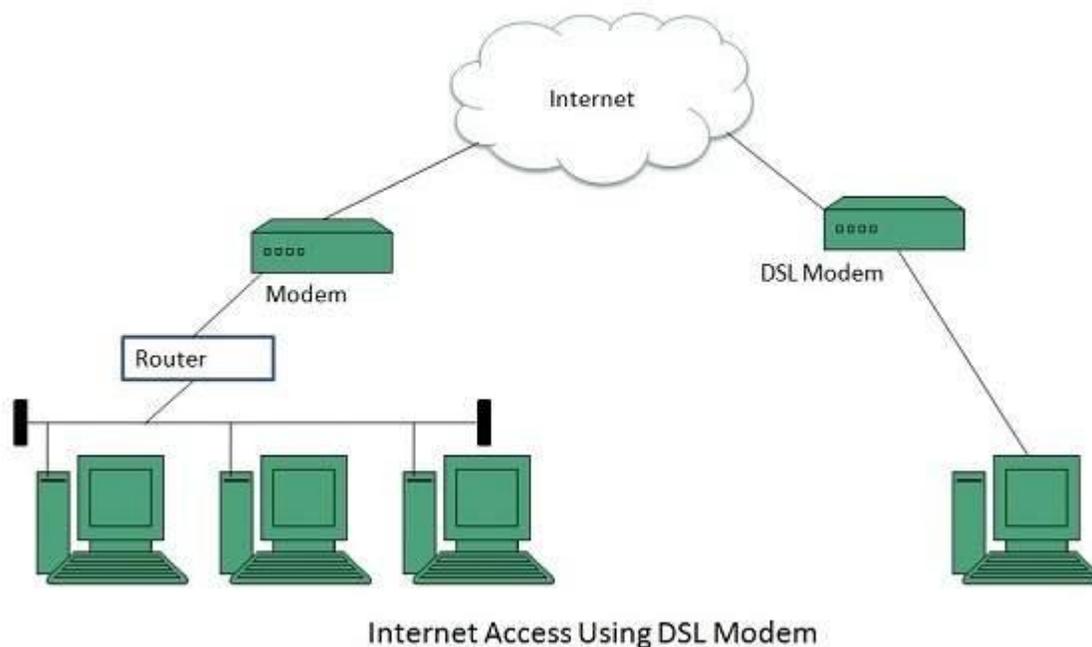
**DSL** is acronym of **Digital Subscriber Line**. It is a form of broadband connection as it provides connection over ordinary telephone lines.

Following are the several versions of DSL technique available today:

1. Asymmetric DSL (ADSL)
2. Symmetric DSL (SDSL)
3. High bit-rate DSL (HDSL)
4. Rate adaptive DSL (RDSL)
5. Very high bit-rate DSL (VDSL)
6. ISDN DSL (IDSL)

All of the above mentioned technologies differ in their upload and download speed, bit transfer rate and level of service.

The following diagram shows that how we can connect to internet using DSL technology:



## Cable TV Internet Connection

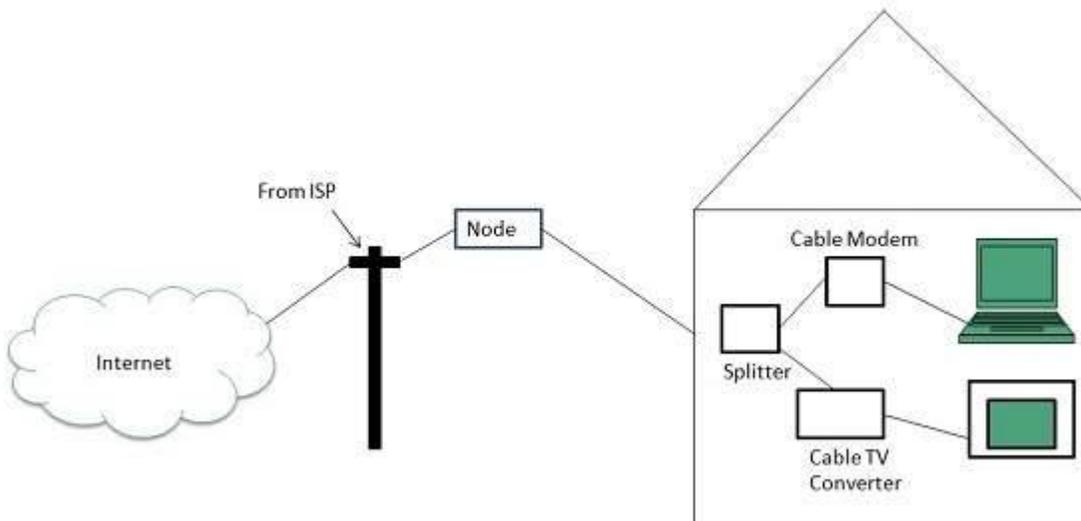
Cable TV Internet connection is provided through Cable TV lines. It uses coaxial cable which is capable of transferring data at much higher speed than common telephone line.

### Key Points:

- A cable modem is used to access this service, provided by the cable operator.

- The Cable modem comprises of two connections: one for internet service and other for Cable TV signals.
- Since Cable TV internet connections share a set amount of bandwidth with a group of customers, therefore, data transfer rate also depends on number of customers using the internet at the same time.

The following diagram shows that how internet is accessed using Cable TV connection:



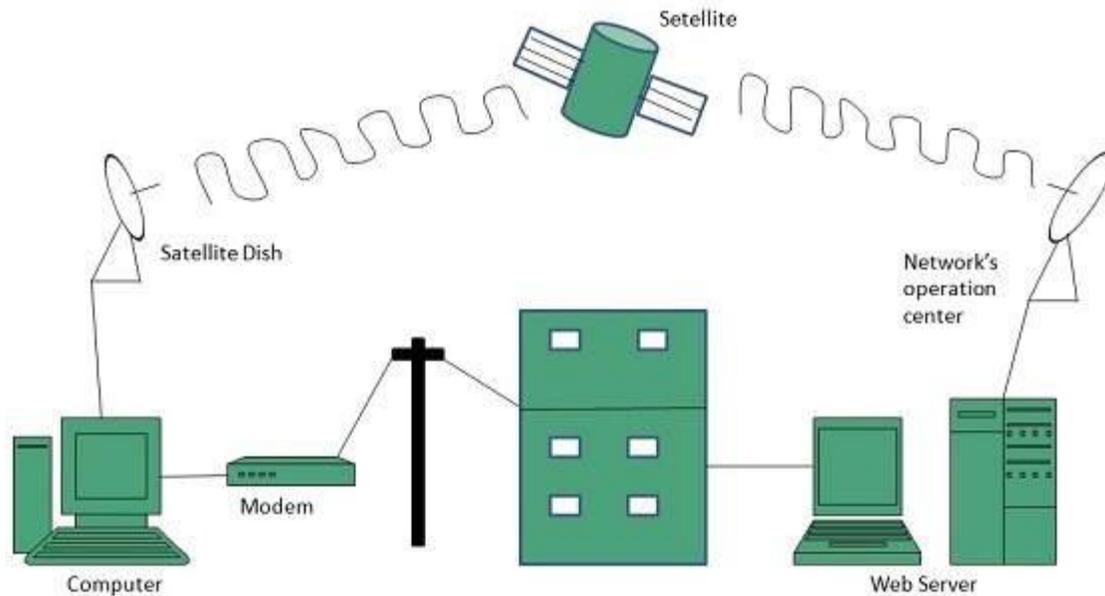
### Satellite Internet Connection

Satellite Internet connection offers high speed connection to the internet. There are two types of satellite internet connection: one way connection or two way connection.

In one way connection, we can only download data but if we want to upload, we need a dialup access through ISP over telephone line.

In two way connection, we can download and upload the data by the satellite. It does not require any dialup connection.

The following diagram shows how internet is accessed using satellite internet connection:



## Wireless Internet Connection

Wireless Internet Connection makes use of radio frequency bands to connect to the internet and offers a very high speed. The wireless internet connection can be obtained by either WiFi or Bluetooth.

### Key Points:

- Wi Fi wireless technology is based on IEEE 802.11 standards which allow the electronic device to connect to the internet.
- Bluetooth wireless technology makes use of short-wavelength radio waves and helps to create personal area network (PAN).

## Transmission Control Protocol (TCP)

TCP is a connection oriented protocol and offers end-to-end packet delivery. It acts as back bone for connection. It exhibits the following key features:

- Transmission Control Protocol (TCP) corresponds to the Transport Layer of OSI Model.
- TCP is a reliable and connection oriented protocol.
- TCP offers:
  - Stream Data Transfer.
  - Reliability.
  - Efficient Flow Control
  - Full-duplex operation.
  - Multiplexing.

- TCP offers connection oriented end-to-end packet delivery.
- TCP ensures reliability by sequencing bytes with a forwarding acknowledgement number that indicates to the destination the next byte the source expect to receive.
- It retransmits the bytes not acknowledged with in specified time period.

## TCP Services

TCP offers following services to the processes at the application layer:

- Stream Delivery Service
- Sending and Receiving Buffers
- Bytes and Segments
- Full Duplex Service
- Connection Oriented Service
- Reliable Service

### Stream Deliver Service

TCP protocol is stream oriented because it allows the sending process to send data as stream of bytes and the receiving process to obtain data as stream of bytes.

### Sending and Receiving Buffers

It may not be possible for sending and receiving process to produce and obtain data at same speed, therefore, TCP needs buffers for storage at sending and receiving ends.

### Bytes and Segments

The Transmission Control Protocol (TCP), at transport layer groups the bytes into a packet. This packet is called segment. Before transmission of these packets, these segments are encapsulated into an IP datagram.

### Full Duplex Service

Transmitting the data in duplex mode means flow of data in both the directions at the same time.

### Connection Oriented Service

TCP offers connection oriented service in the following manner:

1. TCP of process-1 informs TCP of process – 2 and gets its approval.
2. TCP of process – 1 and TCP of process – 2 and exchange data in both the two directions.

3. After completing the data exchange, when buffers on both sides are empty, the two TCP's destroy their buffers.

### Reliable Service

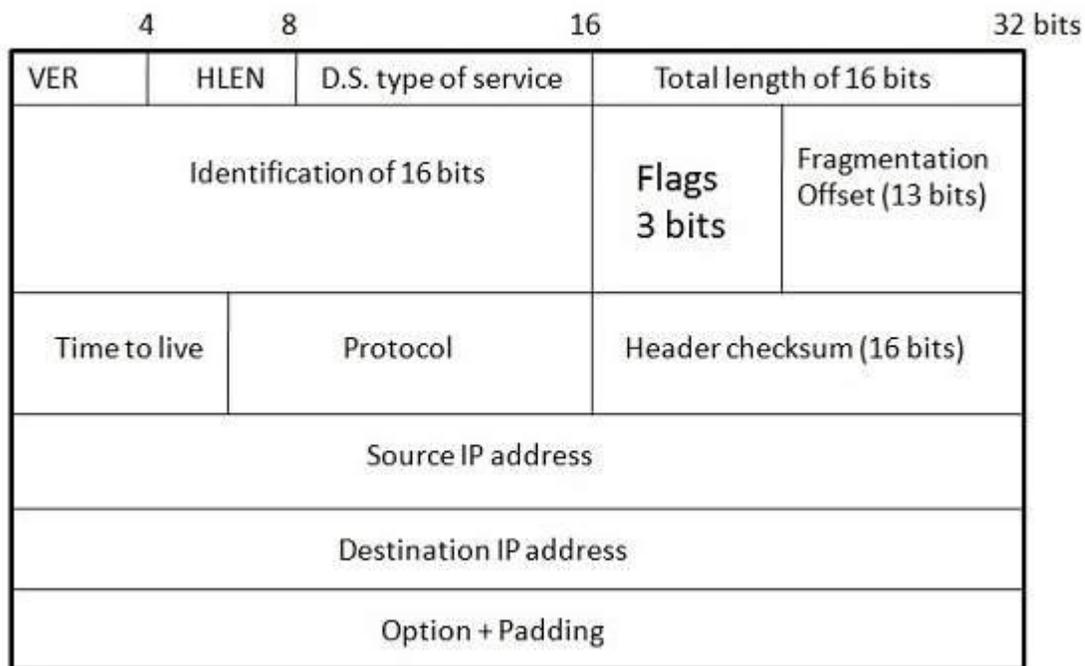
For sake of reliability, TCP uses acknowledgement mechanism.

### Internet Protocol (IP)

Internet Protocol is **connectionless** and **unreliable** protocol. It ensures no guarantee of successfully transmission of data.

In order to make it reliable, it must be paired with reliable protocol such as TCP at the transport layer.

Internet protocol transmits the data in form of a datagram as shown in the following diagram:



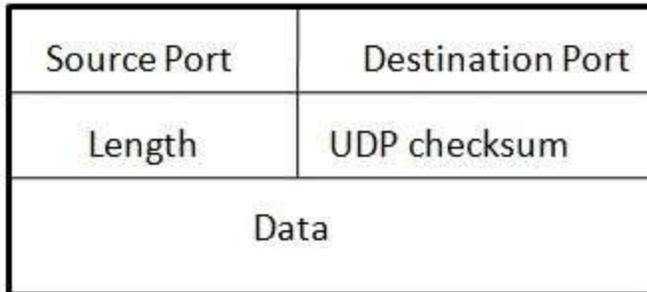
### Points to remember:

- The length of datagram is variable.
- The Datagram is divided into two parts: **header** and **data**.
- The length of header is 20 to 60 bytes.
- The header contains information for routing and delivery of the packet.

### User Datagram Protocol (UDP)

Like IP, UDP is connectionless and unreliable protocol. It doesn't require making a connection with the host to exchange data. Since UDP is unreliable protocol, there is no mechanism for ensuring that data sent is received.

UDP transmits the data in form of a datagram. The UDP datagram consists of five parts as shown in the following diagram:



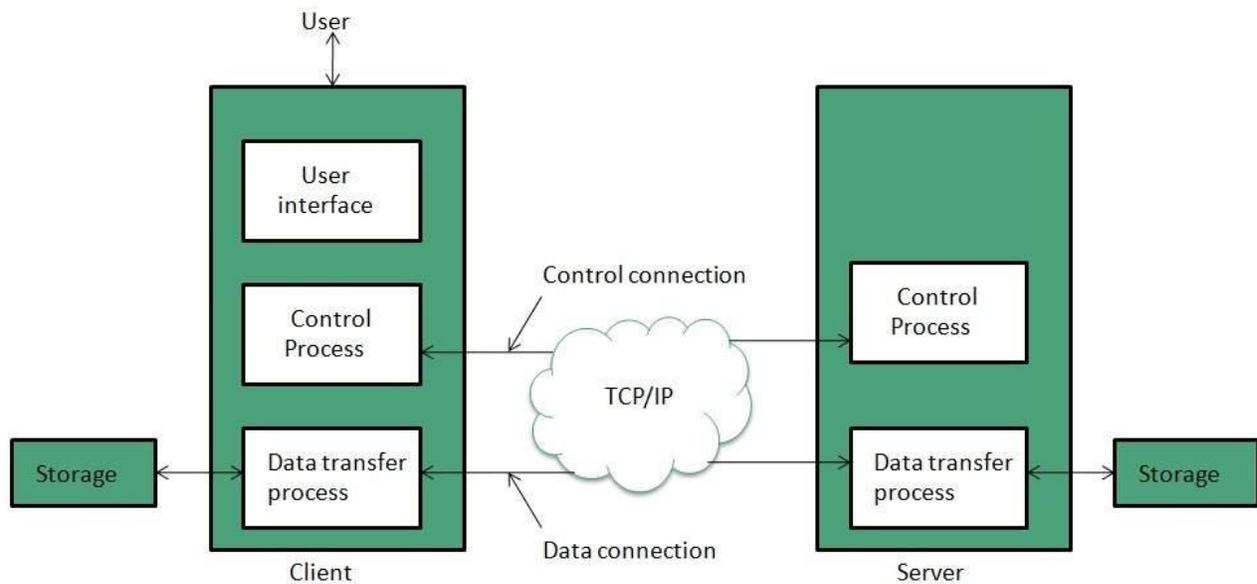
**Points to remember:**

- UDP is used by the application that typically transmit small amount of data at one time.
- UDP provides protocol port used i.e. UDP message contains both source and destination port number, that makes it possible for UDP software at the destination to deliver the message to correct application program.

**File Transfer Protocol (FTP)**

FTP is used to copy files from one host to another. FTP offers the mechanism for the same in following manner:

- FTP creates two processes such as Control Process and Data Transfer Process at both ends i.e. at client as well as at server.
- FTP establishes two different connections: one is for data transfer and other is for control information.
- **Control connection** is made between **control processes** while **Data Connection** is made between `<="" b="">`
- FTP uses **port 21** for the control connection and **Port 20** for the data connection.



### Trivial File Transfer Protocol (TFTP)

**Trivial File Transfer Protocol** is also used to transfer the files but it transfers the files without authentication. Unlike FTP, TFTP does not separate control and data information. Since there is no authentication exists, TFTP lacks in security features therefore it is not recommended to use TFTP.

#### Key points

- TFTP makes use of UDP for data transport. Each TFTP message is carried in separate UDP datagram.
- The first two bytes of a TFTP message specify the type of message.
- The TFTP session is initiated when a TFTP client sends a request to upload or download a file.
- The request is sent from an ephemeral UDP port to the **UDP port 69** of an TFTP server.

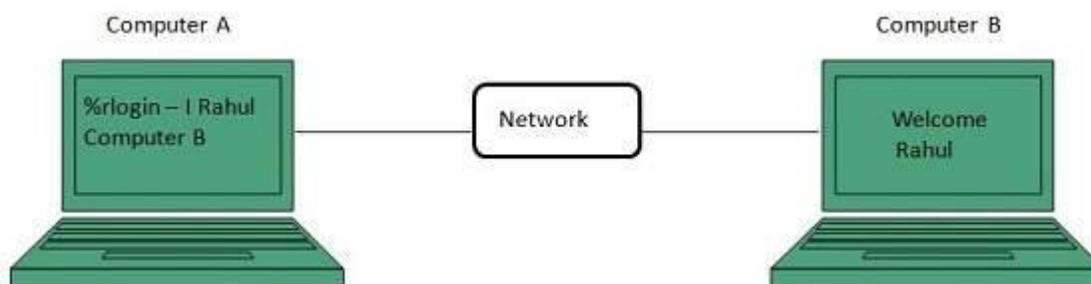
#### Difference between FTP and TFTP

S.N.	Parameter	FTP	TFTP
1	Operation	Transferring Files	Transferring Files
2	Authentication	Yes	No

3	Protocol	TCP	UDP
4	Ports	21 – Control, 20 – Data	Port 3214, 69, 4012
5	Control and Data	Separated	Separated
6	Data Transfer	Reliable	Unreliable

## Telnet

Telnet is a protocol used to log in to remote computer on the internet. There are a number of Telnet clients having user friendly user interface. The following diagram shows a person is logged in to computer A, and from there, he remote logged into computer B.



## Hyper Text Transfer Protocol (HTTP)

HTTP is a communication protocol. It defines mechanism for communication between browser and the web server. It is also called request and response protocol because the communication between browser and server takes place in request and response pairs.

### HTTP Request

HTTP request comprises of lines which contains:

- Request line
- Header Fields
- Message body

### Key Points

- The first line i.e. the **Request line** specifies the request method i.e. **Get** or **Post**.

- The second line specifies the header which indicates the domain name of the server from where index.htm is retrieved.

## HTTP Response

Like HTTP request, HTTP response also has certain structure. HTTP response contains:

- Status line
- Headers
- Message body

## Unit-2: Internet connectivity:

The term "**Internet connectivity**" refers to the way people are hooked up to the **Internet**, and may include dial-up telephone lines, always-on broadband connections, and wireless devices. Among these, wireless access to the **Internet** is the newest and, as of the early 2000s, had only reached a small group of users.

### Internet Connection and Access Methods

There are several ways or methods of connecting to the Internet.

There are two access methods **direct and Indirect** and these can be either **fixed or mobile**.

### Indirect Access

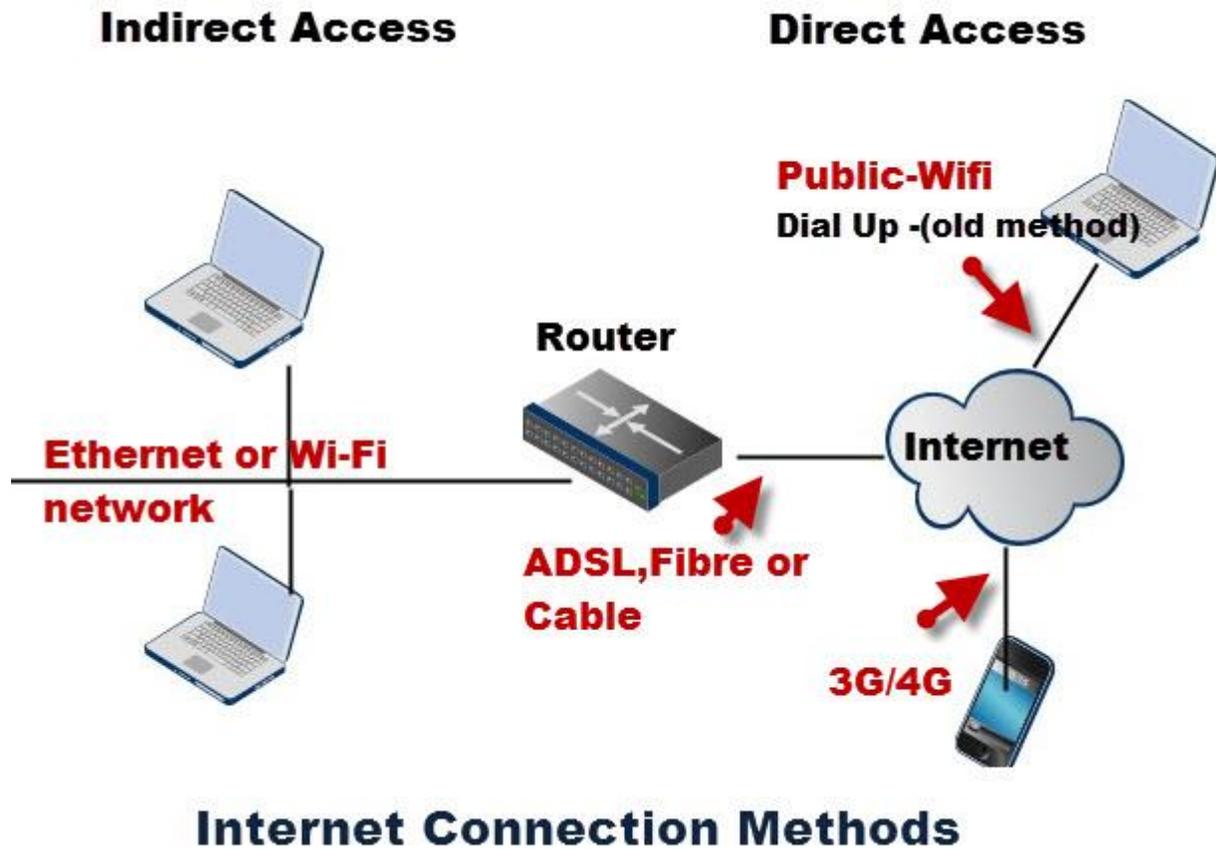
This is most common method used in home and office networks.

The device e.g. computer connects to a network using **Ethernet or WiFi** and the network connects to the Internet using ADSL, cable or fibre.

### Direct Access

This is most common method used when traveling.

The device e.g. smart phone connects directly to the Internet using 3G/4G mobile networks or public Wi-Fi.



## Internet Connection Methods

### Fixed Internet- Home/Office

Fixed access is usually much faster and reliable than mobile, and is used for connecting homes/offices. The main Access mechanisms are:

- ADSL over traditional Phone Lines (most common).
- Cable (limited to cable TV areas)
- Fibre broadband – Currently being Rolled out

### Pros

- Very Fast and reliable
- Good for streaming video
- Cheap when compared to Mobile
- Can easily share the connection

### Cons

- Requires a fixed connection

- Not usable when at a remote location

Fixed access is the most common way that businesses and home users use for connecting to the Internet

## **Mobile Internet**

When travelling away from the fixed location mobile access is used.

Mobile Internet tends to be mainly a secondary access mechanism. The main access methods are:

- Mobile broadband over 3G Network (common but slow) or 4G
- Public/ Private Wi-Fi (common)

**Note 1:** Broadband is a generic term and in communications. It refers to a channel with transmission rates above 256kbits/sec but typically (UK) above 4Mbps/s (for ADSL). Wi-Fi is classed as broadband.

**Note 2:** Although this article mentions UK providers as I am UK based the same access mechanisms are used in North America and other countries.

## **Pros**

- No fixed connection required
- Available from remote locations

## **Cons**

- Not as Fast and reliable as Fixed Access
- Not good for streaming video
- Expensive
- Can't easily share the connection

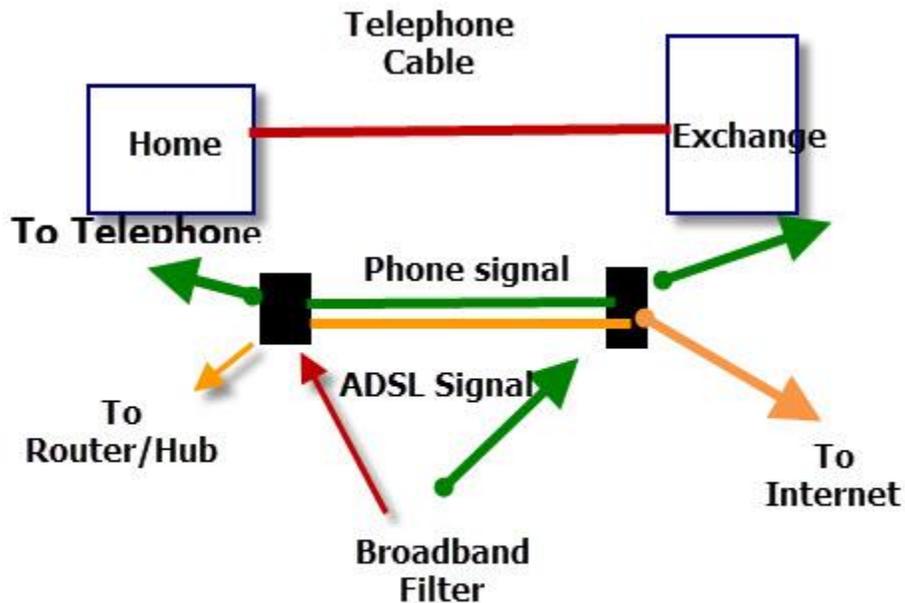
## **ADSL Broadband over Existing Phone Lines**

This is probably the most common way to connect to the Internet for home and small business users.

Connection to the Internet for home/home offices is usually accomplished with ADSL (*Asymmetric digital subscriber line*) which uses the **existing telephone cabling infrastructure**.

In the UK BT (British Telecom) provide the familiar telephone connection to most homes, and these same telephone wires are used to provide broadband internet using **ADSL** technology.

*The broadband connection and the standard phone service share the same telephone lines without interfering with each other.*



## ADSL Over Phone Lines

It is the job of the broadband filter to **split** the phone signal from the broadband signal.

A **filter must be installed** on a telephone extension that has a telephone connected.

The Internet Signal from the filter is feed into a broadband router/Hub which can be used to form a home network.

BT provide their own broadband services using these telephone lines, and must also provide access to these lines to third party providers.

Other providers that utilize these BT lines are:

- SKY broadband
- Talk Talk broadband
- Virgin National Broadband

The same access policy has been adopted in most countries.

Broadband speeds quoted by providers are the maximum that is possible over an ADSL connection, and the speed you actually get depends mainly on how far you are from the local telephone exchange.

See [Understanding Broadband Speeds and speed tests](#)

## **Cable Broadband**

Cable connects you to the Internet through a coaxial cable usually using the same line as your TV service.

Cable connections offer very high connection speeds, but the connection may be shared with other users.

This means that you can experience much slower speeds due to congestion.

In the UK Virgin Media are the only suppliers of cable broadband which they market as fibre broadband.

However it is not fibre all the way to the home but fibre to the cabinet, as the last part of the connection utilises the old coaxial cable connections.

Despite this download speeds of up to **152Mbs** are being offered on broadband packages.

## **Fibre or Fiber Broadband**

This is currently being rolled out in the UK by BT, and offers download speeds of 76Mbit/s.

BT offer two types depending on your location:

- fibre to home
- fibre to cabinet or kerb

**Fibre to the home** is the fastest and means that the connection from the home to the exchange is all fibre. This service require new hardware. See [Preparing for install](#).

**Fibre to the cabinet** (kerb) is slower than fibre to the home. In these connections the fibre is provided to a distribution point near the home and the standard telephone lines provide the connection to the home using **VDSL**.

**VDSL** isn't fibre but used in conjunction with fibre in what is know as fibre to the kerb connections.

When purchasing a home router it is impotant to choose one that supports your connection type (ADSL or VDSL)

### ***Other UK Providers***

Just as with ADSL broadband other operators have access to the BT fibre network and will offer fibre services that use the BT infrastructure.

Virgin Media are the only other UK provider of fibre connections.

Although probably not as common as ADSL this is the best way to connect to the Internet if it is available in your area.

### **Mobile Broadband 3G and 4G**

3G and 4G networks are provided by mobile phone operators.

3G mobile phone networks are the most common, and have the widest coverage area, whereas the newer 4G networks are less common with restricted coverage area.

Mobile Internet services are available on a contract or **pay as you go** basis.

### **3G**

3G mobile networks were designed mainly for phone calls (voice) but with improved internet access speeds when compared to the earlier 2G standard.

A **3G** mobile phone can make voice calls, and also access the Internet using a data channel.

Mobile phone operators usually have two separate plans – standard voice plans and a data plan.

Data plans tend to have restricted download limits and exceeding them can be expensive.

Internet access speeds will vary depending on technology and location, but you can expect between 200kbps and 7.2Mbps.

### **4G Broadband.**

– This is currently in the initial phases of being rolled out in the UK. It uses HSPA+ access mechanism with speeds of up to 168 Mbit/s in the downlink and 22 Mbit/s in the uplink.

4G networks are expected eventually to offer download speeds of up to 1Gbits/s (LTE advanced). 4G mobile networks are designed primarily for carrying data using the IP protocol. Capability is already built into Google Nexus 7 (mobile data model) and the Nexus 4 mobile phone.

Due to the excellent speed potential 4G networks may replace fixed line networks in some rural areas. In developing countries and new build areas it could become the main connection type.

Routers are available that support Mobile Internet connections so you can share the connection just like you do with fixed broadband.

In the UK (2020) network providers quote typical download speeds of 8-10Mbits/s and upload speeds of around 5Mbits/s.

### **Public Wi-Fi -Wireless Broadband**

The wireless technology used is the same as is used in home wireless networking, and hence if you have laptop/pda that is equipped for connection to a home or office wireless network then it will also work on a **public wireless network**.

The problem with this is that it is only available only in limited areas usually public areas like airports, train stations etc, and it poses a very strong security risks.

### **Old Methods- Not Really Used Any More**

These types of access date back to the early days of the Internet, and may no longer be provided by most ISPs.

### **Dial-Up Analogue Connection -56K**

**Monthly Cost:** Varies from 1p per minute to £13 per month (unlimited access)

**Speed:** Up to 56Kbps

**Hardware Requirements:** 56k modem included in most modern PCs (approx. £25-£50 )

<b>Advantages</b>	<b>Disadvantages</b>
Inexpensive Wide availability	Using a modem ties up a phone line Connection is not “always on” Slowest access method Security danger see rogue Internet diallers

### Suitability

Basic Internet browsing and email. Not suitable if regularly downloading or uploading large files like music, video or pictures.

With the rapid adoption of ADSL dial up access is often only used as a secondary/ backup Internet access method for mobile users.

You should be vary wary of this connection type due to Rogue Internet Dialler software.

### *ISDN*

This was the main method for high speed Internet access prior to ADSL and is now no longer used.

It is similar to dial-up, ISDN establishes a connection to your service provider when you access the Internet. However, ISDN circuits are 64-128K and fully digital.

ISDN is not easy to install and troubleshoot and requires you to have an ISDN box installed by your telephone company.

It was used by small businesses as in addition to the ISDN line you can also use a normal telephone line at the same time . This means you can access the Internet as well as talking on the telephone.

**Monthly Cost:** As Analogue dial up

**Speed:** 64Kbps – 128Kbps

**Hardware Requirements:** ISDN card (£30-£60) or router ( £200-£300)

Advantages	Disadvantages
<p>Lets you talk and surf simultaneously.  Faster than 56kbps analogue  Suitable for attaching more than 1 PC to the Internet ( 2-6 light users)</p>	<p>difficult to setup  Available only in limited areas  Requires special termination equipment to be fitted by the company at both ends of the telephone line  Outdated being replaced by DSL  Not practical for more than 6 computers (depending on usage)  Security danger see rogue Internet diallers</p>

### Suitability

Basic Internet browsing and email and connection sharing. Not suitable if regularly downloading or uploading very large files like music, video or pictures.

You should be vary wary of this connection type due to **Rogue Internet Dialler** software.

ecause most people download more data than they upload ADSL uses different **upload and download** speeds.

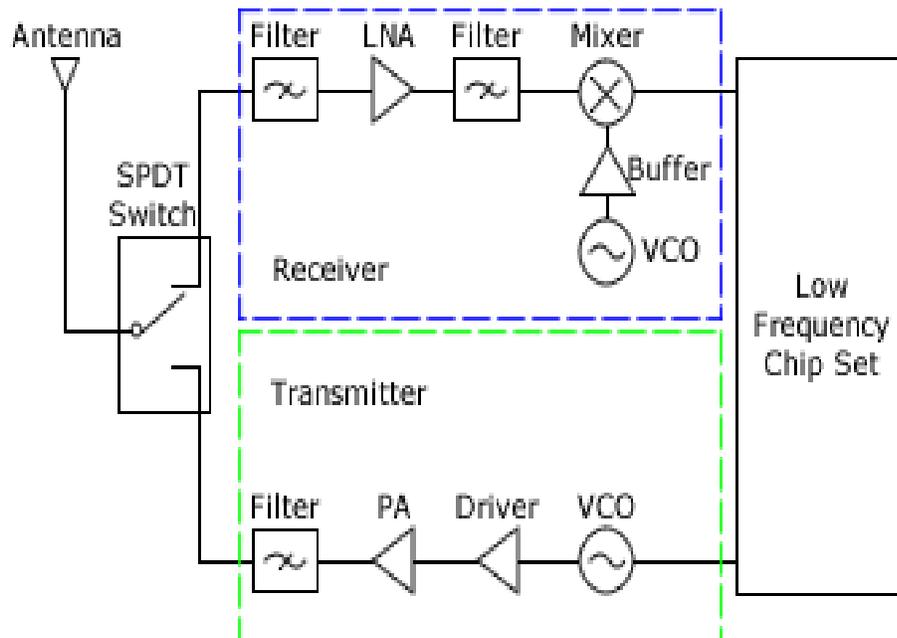
There is also SDSL (**Synchronous Digital Subscriber Line**) which offers the **same** upload and download speeds.

### VSAT (Very Small Aperture Terminal)

VSAT (Very Small Aperture Terminal) is a satellite communications system that serves home and business users. A VSAT end user needs a box that interfaces between the user's computer and an outside antenna with a transceiver. The transceiver receives or sends a signal to a satellite transponder in the sky. The satellite sends and receives signals from an earth station computer that acts as a hub for the system. Each end user is interconnected with the hub station via the satellite in a star topology. For one end user to communicate with another, each transmission has to first go to the hub station which retransmits it via the satellite to the other end user's VSAT. VSAT handles data, voice, and video signals.

VSAT is used both by home users who sign up with a large service such as DirecPC and by private companies that operate or lease their own VSAT systems. VSAT offers a number of advantages over terrestrial alternatives. For private applications, companies can have total control of their own communication system without dependence on other companies. Business and home users also get higher speed reception than if using ordinary telephone service or ISDN.

## RF Wireless Technology



A radio frequency (RF) signal refers to a wireless electromagnetic signal used as a form of communication, if one is discussing wireless electronics. Radio waves are a form of electromagnetic radiation with identified radio frequencies that range from 3kHz to 300 GHz. Frequency refers to the rate of oscillation (of the radio waves.) RF propagation occurs at the speed of light and does not need a medium like air in order to travel. RF waves occur naturally from sun flares, lightning, and from stars in space that radiate RF waves as they age. Humankind communicates with artificially created radio waves that oscillate at various chosen frequencies. RF communication is used in many industries including television broadcasting, radar systems, computer and mobile platform networks, remote control, remote metering/monitoring, and many more.

While individual radio components such as mixers, filters, and power amplifiers can be classified according to operating frequency range, they cannot be strictly categorized by wireless standard (e.g. Wi-Fi, Bluetooth, etc.) because these devices only provide physical layer (PHY) support. In contrast, RF modules, transceivers, and SoCs often include data link layer support for one or more wireless communication protocols. These products are organized by wireless technology and can be browsed under the "Solutions" tab.

## The Internet Routing Hierarchy

So how do packets find their way across the Internet? Does every computer connected to the Internet know where the other computers are? Do packets simply get 'broadcast' to every computer on the Internet? The answer to both the preceding questions is 'no'. No computer knows where any of the other computers are, and packets do not get sent to every computer. The

information used to get packets to their destinations are contained in routing tables kept by each router connected to the Internet.

**Routers are packet switches.** A router is usually connected between networks to route packets between them. Each router knows about its sub-networks and which IP addresses they use. The router usually doesn't know what IP addresses are 'above' it. Examine Diagram 5 below. The black boxes connecting the backbones are routers. The larger NSP backbones at the top are connected at a NAP. Under them are several sub-networks, and under them, more sub-networks. At the bottom are two local area networks with computers attached.

#### Diagram 5

When a packet arrives at a router, the router examines the IP address put there by the IP protocol layer on the originating computer. The router checks its routing table. If the network containing the IP address is found, the packet is sent to that network. If the network containing the IP address is not found, then the router sends the packet on a default route, usually up the backbone hierarchy to the next router. Hopefully the next router will know where to send the packet. If it does not, again the packet is routed upwards until it reaches a NSP backbone. The routers connected to the NSP backbones hold the largest routing tables and here the packet will be routed to the correct backbone, where it will begin its journey 'downward' through smaller and smaller networks until it finds its destination.

### **Domain Names and Address Resolution**

But what if you don't know the IP address of the computer you want to connect to? What if the you need to access a web server referred to as *www.anothercomputer.com*? How does your web browser know where on the Internet this computer lives? The answer to all these questions is the **Domain Name Service** or **DNS**. The DNS is a distributed database which keeps track of computer's names and their corresponding IP addresses on the Internet.

Many computers connected to the Internet host part of the DNS database and the software that allows others to access it. These computers are known as DNS servers. No DNS server contains the entire database; they only contain a subset of it. If a DNS server does not contain the domain name requested by another computer, the DNS server re-directs the requesting computer to another DNS server.

### Diagram 6

The Domain Name Service is structured as a hierarchy similar to the IP routing hierarchy. The computer requesting a name resolution will be re-directed 'up' the hierarchy until a DNS server is found that can resolve the domain name in the request. Figure 6 illustrates a portion of the hierarchy. At the top of the tree are the domain roots. Some of the older, more common domains are seen near the top. What is not shown are the multitude of DNS servers around the world which form the rest of the hierarchy.

When an Internet connection is setup (e.g. for a LAN or Dial-Up Networking in Windows), one primary and one or more secondary DNS servers are usually specified as part of the installation. This way, any Internet applications that need domain name resolution will be able to function correctly. For example, when you enter a web address into your web browser, the browser first connects to your primary DNS server. After obtaining the IP address for the domain name you entered, the browser then connects to the target computer and requests the web page you wanted.

Introduction to WWW

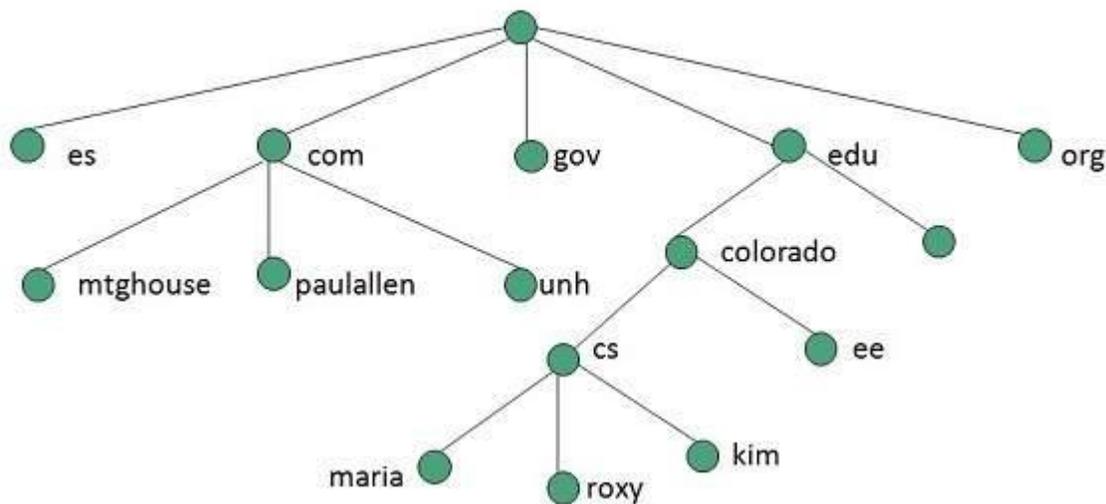
**WWW** stands for **World Wide Web**. A technical definition of the World Wide Web is : all the resources and users on the Internet that are using the Hypertext Transfer Protocol (HTTP).

A broader definition comes from the organization that Web inventor **Tim Berners-Lee** helped found, the **World Wide Web Consortium (W3C)**.

The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge.

In simple terms, The World Wide Web is a way of exchanging information between computers on the Internet, tying them together into a vast collection of interactive multimedia resources.

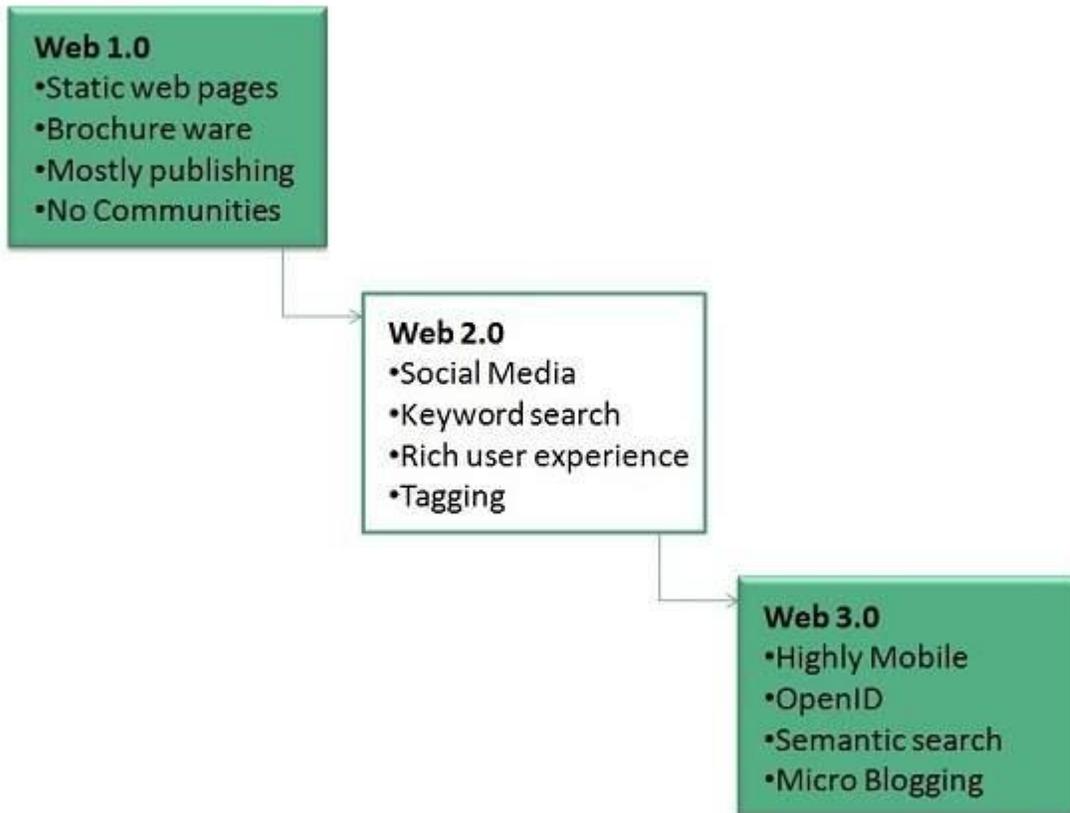
**Internet** and **Web** is not the same thing: Web uses internet to pass over the information.



## Evolution

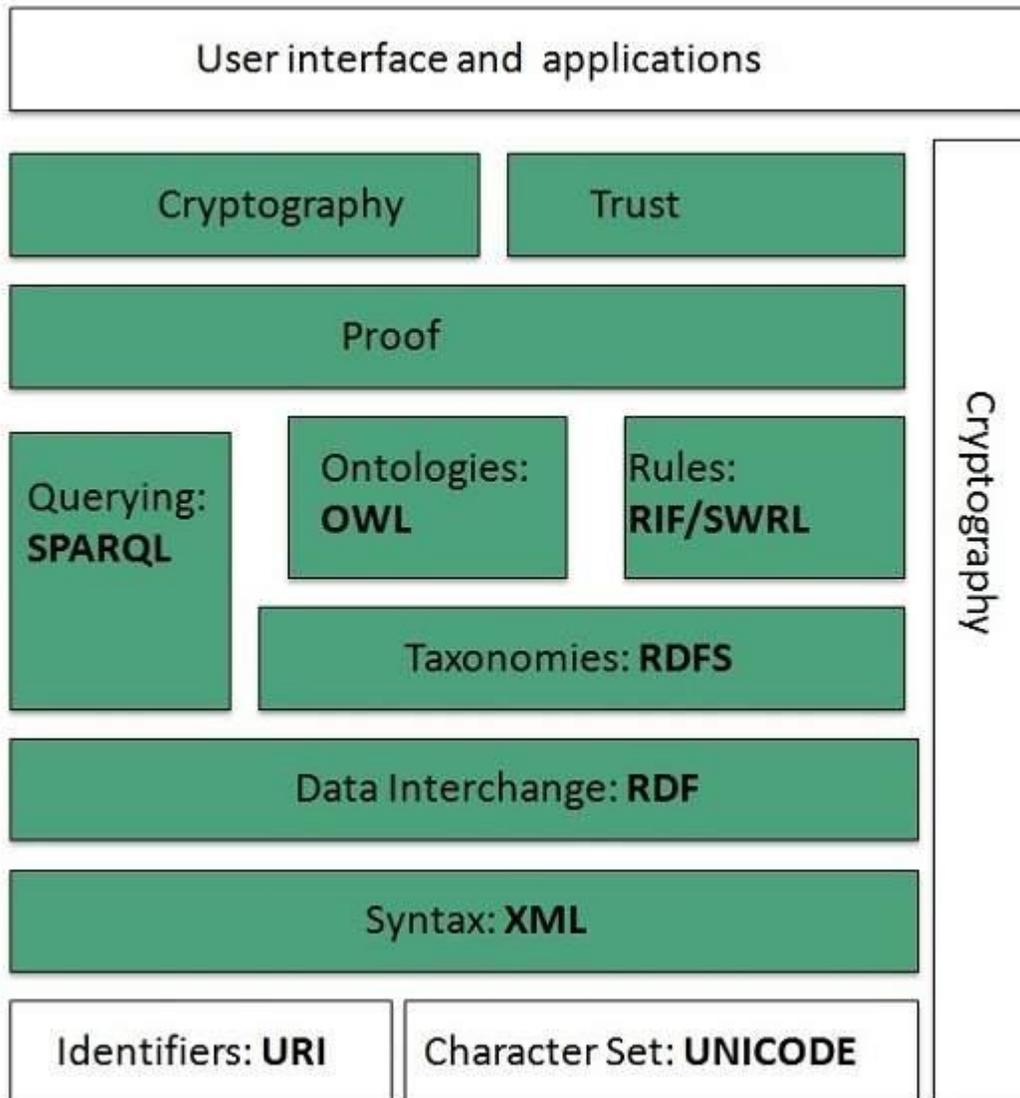
**World Wide Web** was created by **Timothy Berners Lee** in 1989 at **CERN** in **Geneva**. World Wide Web came into existence as a proposal by him, to allow researchers to work together effectively and efficiently at **CERN**. Eventually it became **World Wide Web**.

The following diagram briefly defines evolution of World Wide Web:



## WWW Architecture

WWW architecture is divided into several layers as shown in the following diagram:



### Identifiers and Character Set

**Uniform Resource Identifier (URI)** is used to uniquely identify resources on the web and **UNICODE** makes it possible to build web pages that can be read and written in human languages.

### Syntax

**XML (Extensible Markup Language)** helps to define common syntax in the semantic web.

### Data Interchange

**Resource Description Framework (RDF)** framework helps in defining the core representation of data for the web. RDF represents data about a resource in graph form.

## Taxonomies

**RDF Schema (RDFS)** allows more standardized description of **taxonomies** and other **ontological** constructs.

## Ontologies

**Web Ontology Language (OWL)** offers more constructs over RDFS. It comes in following three versions:

- OWL Lite for taxonomies and simple constraints.
- OWL DL for full description logic support.
- OWL for more syntactic freedom of RDF

## Rules

**RIF** and **SWRL** offers rules beyond the constructs that are available from **RDFs** and **OWL**. Simple Protocol and **RDF Query Language (SPARQL)** is SQL like language used for querying RDF data and OWL Ontologies.

## Proof

All semantic and rules that are executed at layers below Proof and their result will be used to prove deductions.

## Cryptography

**Cryptography** means such as digital signature for verification of the origin of sources is used.

## User Interface and Applications

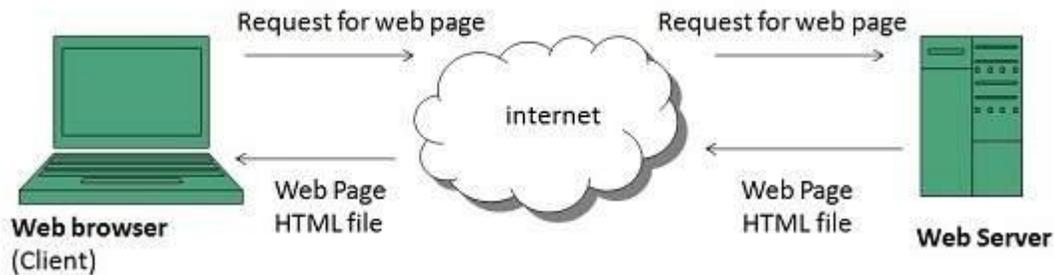
On the top of layer **User interface and Applications** layer is built for user interaction.

## WWW Operation

**WWW** works on client- server approach. Following steps explains how the web works:

1. User enters the URL (say, **http://www.tutorialspoint.com**) of the web page in the address bar of web browser.
2. Then browser requests the Domain Name Server for the IP address corresponding to **www.tutorialspoint.com**.
3. After receiving IP address, browser sends the request for web page to the web server using HTTP protocol which specifies the way the browser and web server communicates.

4. Then web server receives request using HTTP protocol and checks its search for the requested web page. If found it returns it back to the web browser and close the HTTP connection.
5. Now the web browser receives the web page, It interprets it and display the contents of web page in web browser's window.



## Future

There had been a rapid development in field of web. It has its impact in almost every area such as education, research, technology, commerce, marketing etc. So the future of web is almost unpredictable.

Apart from huge development in field of WWW, there are also some technical issues that W3 consortium has to cope up with.

## User Interface

Work on higher quality presentation of 3-D information is under deveopment. The W3 Consortium is also looking forward to enhance the web to full fill requirements of global communities which would include all regional languages and writing systems.

## Technology

Work on privacy and security is under way. This would include hiding information, accounting, access control, integrity and risk management.

## Architecture

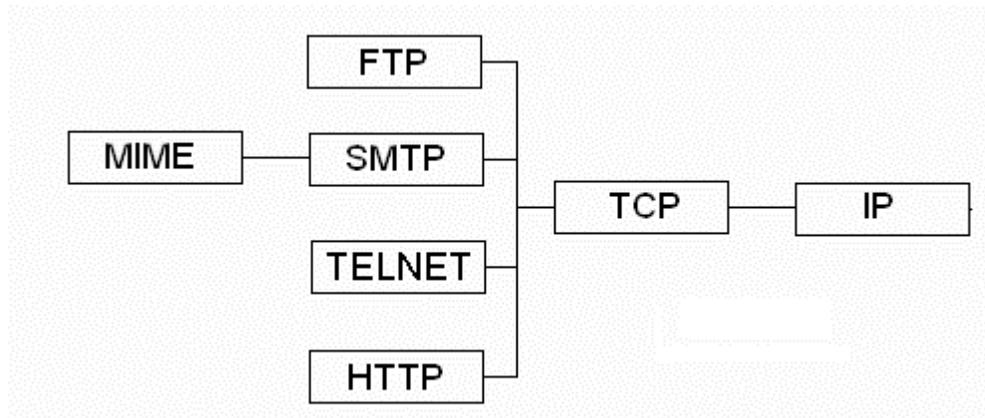
There has been huge growth in field of web which may lead to overload the internet and degrade its performance. Hence more better protocol are required to be developed.

## Application Level Protocols

Networks build their various communication protocols on top of each other. While IP allows a computer to communicate across a network, it misses various features which TCP adds. TCP itself is a network protocol that uses IP underneath it. The application software that creates the

original source data is also important in determining the protocol that is used: the destination application must understand the data being transmitted to it, and for this a well define communications protocol is needed. While different classes of application each specify their own protocol (such as email, which transfers data differently to, say, HTTP), they each build on top of lower level protocols, such as TCP and IP. These "higher level" protocols are known as application level protocols, and we will investigate a few of these now.

The figure below shows the relation between different protocols.



SMTP, the protocol used for sending email, is the workhorse protocol built on TCP/IP. However, SMTP can send only text messages. The growing need to send more than text has led to the introduction of Mime.

### **Simple Mail Transfer Protocol (SMTP)**

SMTP messages on the ASCII character set (the ISO 646 set). This means that only 255 different characters can be used in an email. SMTP also logs the route taken by any particular email message. There are three main areas to consider: The Sender, the protocol and the receiver:

#### **Sender**

- If the message is being sent to multiple users on a single host, then only a single copy of that message need be sent to the host.
- It resends the message if it was initially unsuccessful in sending it. Re-queuing should not be an indefinite process and should stop after email's "lifetime" has Expired.
- Informs the user if they have supplied a malformed Address.

#### **Protocol**

- The protocol is used to transfer a message from the sender to the receiver over a TCP Connection.
- It does not supply delivery notifications, although SMTP is generally reliable.

#### **Receiver**

- The receiver accepts incoming mail and distributes it to the correct mailboxes.
- Each message has a header defined in RFC 822 and usually follows the format below:
  - Date: Mon, 14 Mar 2005 09:26:34 (GMT+2)
  - From: 'CS Network Administrator' < admin@cs.uct.ac.za >
  - Subject: Use of Computer Laboratories
  - To: jsmith@cs.uct.ac.za
  - CC:tadams@cs.uct.ac.za

## **Multipurpose Internet Mail Extensions (MIME)**

MIME addresses the following problems with SMTP and RFC 822:

- SMTP is restricted to the 7-bit ASCII character set.
- SMTP places limits on the size of an email message.
- SMTP cannot transmit either executable or binary files.

Additions to the message header provide solutions to these problems. One of these additions is the content type field. Content type specifies the type of data contained in the message so that the data can be handled in an appropriate way. Further changes also allows for multiple independent parts of the message, including attachments.

On being sent, each email message is first divided into fragments based on their MIME type; after establishing a TCP connection, these fragments are then then packaged as a standard SMTP message and sent.

## **Hypertext Transfer Protocol (HTTP)**

A key concept of HTTP is the Universal Resource Locator (URL), which we have already discussed.

An URL is defined as

a compact representation of the location and access method for the resource available via the Internet - (RFC1738, 1808)

A resource can be any kind of file, or more commonly an HTML document. The URL is simply the name and address of that resource. Further, the URL also shows the protocol used to access the resource.

An URL has the following format:

protocol : address

There are many different protocols at this level: FTP, TELNET and HTTP are well known examples. The HTTP URL schema has the following format:

http://host: port / path / file

The default HTTP port is 80, while differs for other protocols. Default values are almost always omitted from an URL.

HTTP is the foundation protocol of the World Wide Web. HTTP is a client-server protocol capable of transferring different types of data: graphics, audio and video. It also facilitates the ability to obtain a single Web page from several locations. HTTP uses TCP, but each page is passed independently: a new TCP connection is made for each request the client makes to the server.

Here are two terms associated with HTTP with which you should become familiar:

- **Proxy:** A proxy is an intermediate system between the client and server: it acts as a server to the client, and as a client to the server. A proxy is often used when a firewall has been set up: it acts as a server, letting only legitimate information through. Due to the many versions of HTTP available, a proxy can be set up between client and server, and each different version of the protocol is directed to the corresponding server.
- **Gateway:** Acts on behalf of the server and can be used for security issues. A gateway acts as an intermediary device that can convert non-HTTP protocols. For example, a request is made to an FTP site. The gateway acts as an intermediate system and makes the request on behalf of the client to the relevant server. The gateway then converts the FTP to HTTP format, which is sent to the client

Both gateways and proxies are useful when securing networks and creating firewalls. Firewalls will be discussed in the security chapter.

### **Activity 1: Packet Route Tracing on the Internet**

Most operating systems provide a way for the user to trace the route taken by IP packets to reach a particular server. Windows XP/2000 has the `tracert` command, which can be run from the command console (Press Start, then run, then type `cmd`, followed by enter). If you use another operating system, find out how you can trace packet routes. The Windows command takes in a destination server's URL and gives a printout of the route taken to reach that server. For example, type in the following command:

```
tracert www.cs.uct.ac.za
```

### **Web Browser?**

Let's play word association, just like when a psychologist asks you what comes to mind when you hear certain words: What do you think when you hear the words "Opera. Safari.Chrome.Firefox."

If you think of the Broadway play version of "The Lion King," maybe it is time to see a psychologist. However, if you said, "Internet browsers," you're spot on. That's because the leading Internet Browsers are:

- Google Chrome
- Mozilla Firefox
- Apple Safari
- Microsoft Internet Explorer
- Microsoft Edge
- Opera
- Maxthon

And that order pretty much lines up with how they're ranked in terms of market share and popularity...today. Browsers come and go. Ten years ago Netscape Navigator was a well-known browser: Netscape is long gone today. Another, called Mosaic, is considered the first modern browser—it was discontinued in 1997.

So, what exactly is a browser?

### **Definition**

A browser, short for web browser, is the software application (a program) that you're using right now to search for, reach and explore websites. Whereas Excel® is a program for spreadsheets and Word® a program for writing documents, a browser is a program for Internet exploring (which is where that name came from).

Browsers don't get talked about much. A lot of people simply click on the "icon" on our computers that take us to the Internet—and that's as far as it goes. And in a way, that's enough. Most of us simply get in a car and turn the key...we don't know what kind of engine we have or what features it has...it takes us where we want to go. That's why when it comes to computers:

- There are some computer users that can't name more than one or two browsers
- Many of them don't know they can switch to another browser for free
- There are some who go to Google's webpage to "google" a topic and think that Google is their browser.

So for some basic browser education sake, let's cover a few points:

- **Know your browser.** Look at the very far-upper-left corner of your screen. You'll see the name of your browser.
- **Get the latest version.** Browsers get updates and updated regularly, usually because computers and technology change fast also. You can check what version of your browser you're currently using by going to [whatbrowser.org](http://whatbrowser.org).
- **Try a different browser.** You can switch to another browser at any time. It won't affect your computer and it will give you an idea of how they are different.
- **Read browser reviews.** You can compare features of the different browsers on websites like <http://internet-browser-review.toptenreviews.com>. You'll learn what kind of features browsers offer and what to look for.

**Hypertext:** Ted Nelson introduced the term Hypertext in 1956. Hypertext is a text which contains the visible text to redirect the targeted page (page URL contained by Hyperlink). It was invented to establish cross-reference in the computer world, similar to that is made in books like an index. However, the usual pattern of reading a book is sequential. But, this hypertext

introduces the idea of cross-referencing the data. This cross-referencing is sort of complicated within the world, but it makes the work easier. If we are surfing on the web, at the time of reading a piece of writing we suddenly encounter a term, which we wanted to understand at that moment. If that term may be a hypertext, we will directly attend that page where we will find the information about that term. So, this eliminates the additional time of searching that term.

**Hyperlink:** The hyperlink contains the URL of the webpages. In a general way, a hyperlink is referenced when a hypertext navigated. These hyperlinks are hidden under the text, image, graphics, audio, video, and gets highlighted once we hover the mouse over it. To activate the hyperlink, we click the hypermedia, which ends up within the opening of the new document. It establishes the connection between the knowledge units, usually known as the target document and therefore the alternate name for the hyperlink is anchor or node.

### Hyperlink Vs Hypertext

Both the term are twins to each other and perform with each other basically complete each other. But few times we get confused about which one is the which one really. To clear that confusion, we will discuss the specificness of both in detail with the proper example and explain the differences as well. Both the terms are used in the WWW(World Wide Web)



### Hypermedia:

Most Web navigation is done by clicking text-based links that open new pages in a Web browser. These links, which are often blue and underlined, are referred to as hypertext, since they allow the user to jump from page to page. Hypermedia is an extension of hypertext that allows images, movies, and Flash animations to be linked to other content.

The most common type of hypermedia is an image link. Photos or graphics on the Web are often linked to other pages. For example, clicking a small "thumbnail" image may open a larger version of the picture in a new window. Clicking a promotional graphic may direct you to an advertiser's website. Flash animations and videos can also be turned into hyperlinks by embedding one or more links that appear during playback.

You can tell if an image or video is a hyperlink by moving the cursor over it. If the cursor changes into a small hand, that means the image or video is linked to another page. Clicking the text, image, or video will open up a new location in your Web browser. Therefore, you should only click a hypertext or hypermedia link when you are ready to leave the current page. If you

want to open the link in a new window, you can usually right click the link and select "Open Link in New Window."

Search Engine:

A search engine is an online tool that searches for results in its database based on the search query (keyword) submitted by the internet user. The results are usually websites that semantically match with the search query.

Search engines find the results in their database, sort them and make an ordered list of these results based on the search algorithm. This list is generally called the search engine results page (SERP).

There are many search engines on the market, while the most widely used is Google. Many website browsers such as Chrome, Firefox, Safari or Edge usually come with a default search engine set as a home page or starting page.

### **How search engines work**

There may be some differences in how the search engines work but the fundamentals remain the same. Each of them has to do the following tasks:

1. Crawling
2. Indexing
3. Creating results

#### **1. Crawling**

Search engines have their own crawlers, small bots that scan websites on the world wide web. These little bots scan all sections, folders, subpages, content, everything they can find on the website.

Crawling is based on finding hypertext links that refer to other websites. By parsing these links, the bots are able to recursively find new sources to crawl.

#### **2. Indexing**

Once the bots crawl the data, it's time for indexing. The index is basically an online library of websites.

Your website has to be indexed in order to be displayed in the search engine results page. Keep in mind that indexing is a constant process. Crawlers come back to each website to detect new data.

### **3. Creating results**

Search engines create the results once the user submits a search query. It's a process of checking the query against all website records in the index. Based on the algorithm, the search engine picks the best results and creates an ordered list.

#### **The most popular search engines**

In terms of worldwide popularity, Google has been #1 for years. This is the list of top 10 most popular search engines:

##### **1. Google**

Google is the giant in the industry and has probably the most sophisticated algorithm. It includes machine learning, AI and RankBrain, another algorithm that can tweak the weights of ranking factors according to user's behavior and quality of previous results. More than 70% internet users worldwide do their searches on Google since 1998.

##### **2. Baidu**

Baidu is the first search engine launched in China in 2000. It's like Chinese Google. Baidu cooperates with companies such as Microsoft, Qualcomm, Intel or Daimler on various AI projects. Similarly to Google, they offer a lot of other solutions such as cloud services, maps, social networking, image and video search and many others.

##### **3. Bing**

Microsoft launched their search engine in 2009 as a new project after earlier search engines MSN Search and Windows Live Search. The main goal was to develop a competitor for Google. From the global point of view, it's not really there but in the US, Bing is the 2nd most popular tool for the internet searches.

#### **4. Yahoo!**

Originally, it was one of the most widely used email providers and search engines. The company grew significantly in the 1990s but after 2000, they somehow started lacking the innovation and lost their value. In 2017, Yahoo! was acquired by Verizon Communications.

#### **5. Yandex**

Yandex Search is the major Russian search engine. According to Wikipedia, Yandex generates more than 50% of all searches in Russia. Though the algorithm is not as sophisticated as Google, it constantly gets better by integrating AI and machine learning that analyze searches and learn from them.

#### **6. Ask**

Ask (formerly Ask Jeeves) was launched in 1996. It was designed to answer questions submitted to the search form. Thanks to the Ask toolbar, this search engine was able to compete with big players such as Bing, Yahoo! and Google. Unfortunately, the toolbar was many times installed as an unwanted browser feature.

#### **7. DuckDuckGo**

DuckDuckGo is a bit different search engine. They protect the users' privacy by not tracking any information. DuckDuckGo doesn't show personalized results based on your previous searches. Likewise, advertisers can't follow the behavior of the users. On the other hand, you can launch ads via Bing since DuckDuckGo is their search partner together with Yahoo.

#### **8. Naver**

Naver is the Google of South Korea. This search engine covers around 75% of searches in the country. It was launched in 1999 and in 2000 it was able to pull out various types of results that match the entered keywords. The results included websites, images, blogs, restaurants, shops, etc. Google launched this feature 5 years later.

## 9. AOL

In the 1990's, AOL was one of the biggest crawler-based search engines. As a company, AOL offers a lot of other services: email service, instant messenger, video content, yellow pages, city guides. The AOL Search is nowadays used by not more than 0.5% of the internet users.

## 10. Dogpile

Dogpile is a metasearch engine, so it creates the search engine results page by doing simultaneous search requests for the same query in other search engines, namely: Google, Yahoo!, Yandex and others. Dogpile was launched in 1995.

### Proxy server:

**Proxy server** is an intermediary server between client and the internet. Proxy servers offers the following basic functionalities:

- Firewall and network data filtering.
- Network connection sharing
- Data caching

Proxy servers allow to hide, conceal and make your network id anonymous by hiding your IP address.

### Purpose of Proxy Servers

Following are the reasons to use proxy servers:

- Monitoring and Filtering
- Improving performance
- Translation
- Accessing services anonymously
- Security

### Monitoring and Filtering

Proxy servers allow us to do several kind of filtering such as:

- Content Filtering
- Filtering encrypted data
- Bypass filters
- Logging and eavesdropping

## Improving performance

It fasten the service by process of retrieving content from the cache which was saved when previous request was made by the client.

## Translation

It helps to customize the source site for local users by excluding source content or substituting source content with original local content. In this the traffic from the global users is routed to the source website through Translation proxy.

## Accessing services anonymously

In this the destination server receives the request from the anonymizing proxy server and thus does not receive information about the end user.

## Security

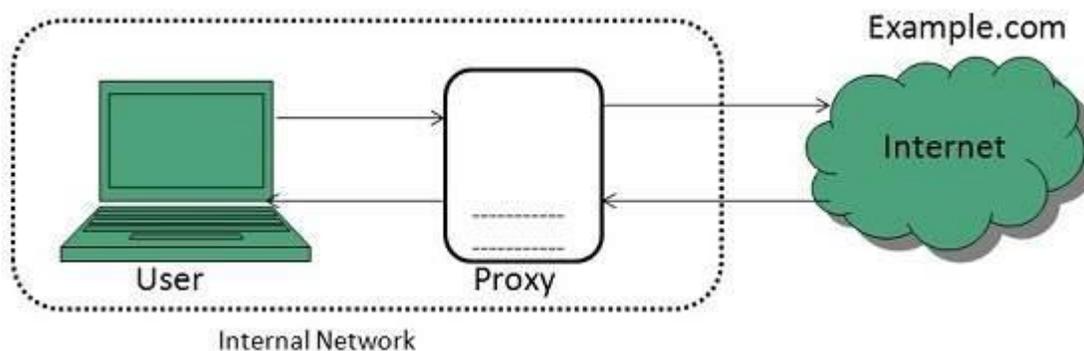
Since the proxy server hides the identity of the user hence it protects from spam and the hacker attacks.

## Type of Proxies

Following table briefly describes the type of proxies:

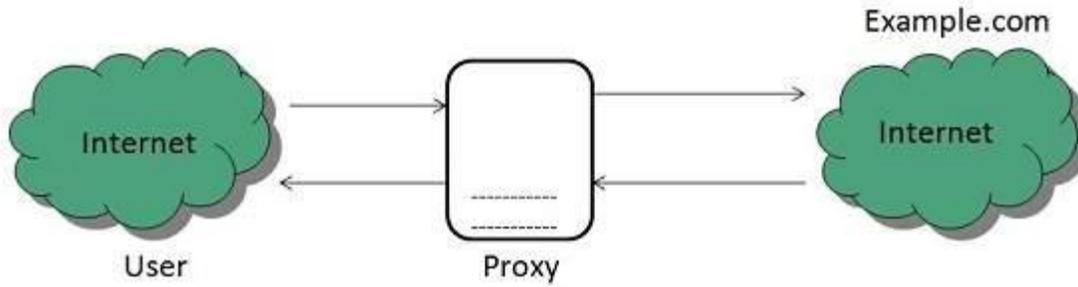
### Forward Proxies

In this the client requests its internal network server to forward to the internet.



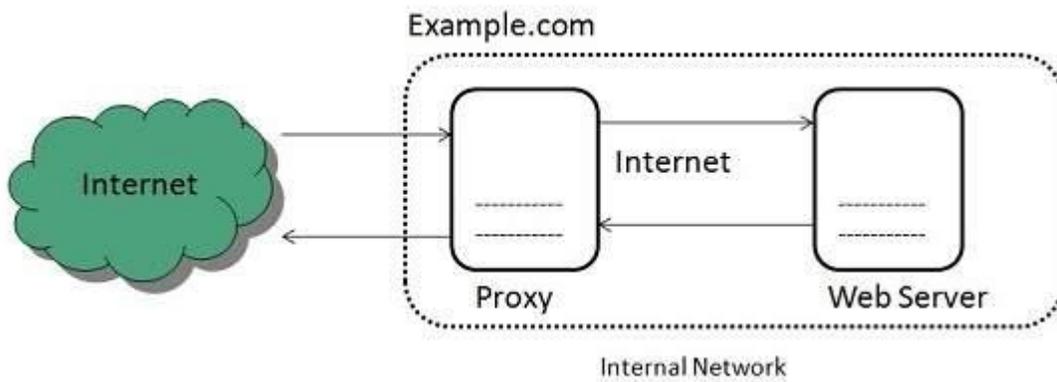
### Open Proxies

Open Proxies helps the clients to conceal their IP address while browsing the web.



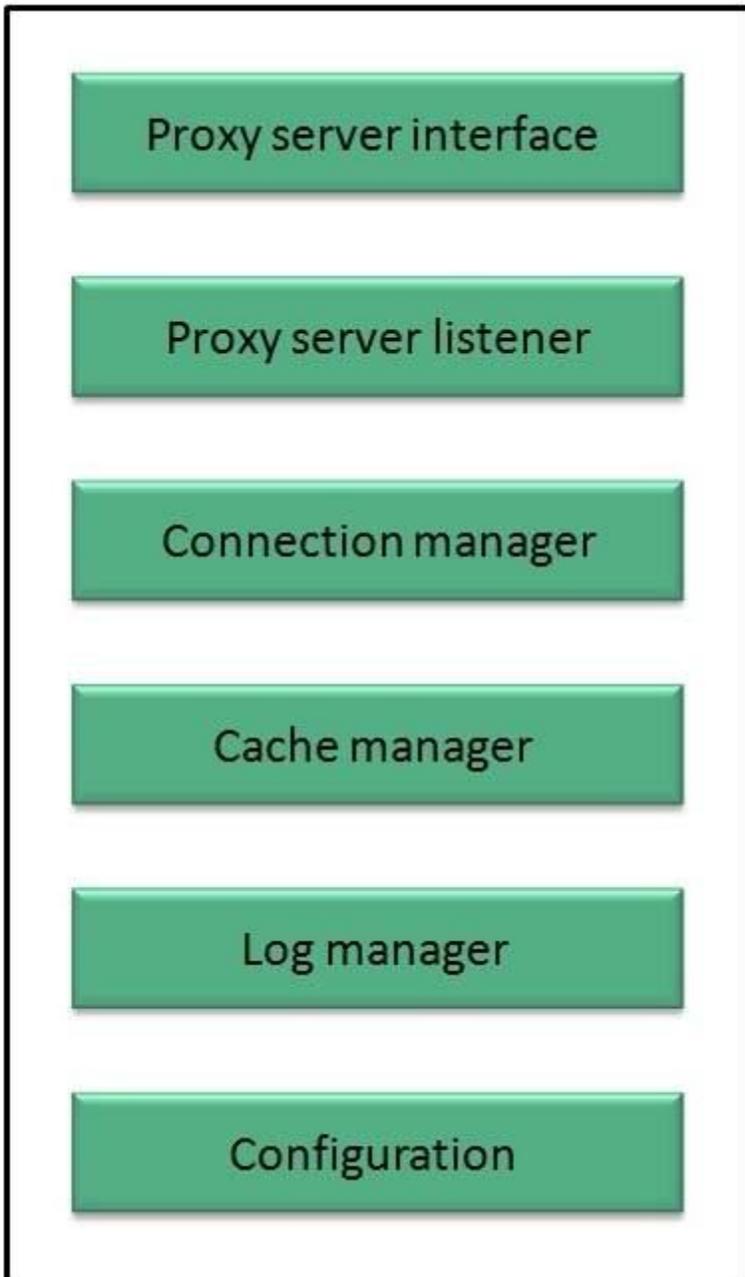
### Reverse Proxies

In this the requests are forwarded to one or more proxy servers and the response from the proxy server is retrieved as if it came directly from the original Server.



### Architecture

The proxy server architecture is divided into several modules as shown in the following diagram:



#### Proxy user interface

This module controls and manages the user interface and provides an easy to use graphical interface, window and a menu to the end user. This menu offers the following functionalities:

- Start proxy
- Stop proxy
- Exit
- Blocking URL

- Blocking client
- Manage log
- Manage cache
- Modify configuration

### Proxy server listener

It is the port where new request from the client browser is listened. This module also performs blocking of clients from the list given by the user.

### Connection Manager

It contains the main functionality of the proxy server. It performs the following functions:

- It contains the main functionality of the proxy server. It performs the following functions:
- Read request from header of the client.
- Parse the URL and determine whether the URL is blocked or not.
- Generate connection to the web server.
- Read the reply from the web server.
- If no copy of page is found in the cache then download the page from web server else will check its last modified date from the reply header and accordingly will read from the cache or server from the web.
- Then it will also check whether caching is allowed or not and accordingly will cache the page.

### Cache Manager

This module is responsible for storing, deleting, clearing and searching of web pages in the cache.

### Log Manager

This module is responsible for viewing, clearing and updating the logs.

### Configuration

This module helps to create configuration settings which in turn let other modules to perform desired configurations such as caching.

### Common Gateway Interface (CGI)

The **Common Gateway Interface (CGI)** provides the middleware between WWW servers and external databases and information sources. The World Wide Web Consortium (W3C) defined the Common Gateway Interface (CGI) and also defined how a program interacts with a Hyper Text Transfer Protocol (HTTP) server. The Web server typically passes the form information to

a small application program that processes the data and may send back a confirmation message. This process or convention for passing data back and forth between the server and the application is called the common gateway interface (CGI).

#### **Features of CGI:**

- It is a very well defined and supported standard.
- CGI scripts are generally written in either Perl, C, or maybe just a simple shell script.
- CGI is a technology that interfaces with HTML.
- CGI is the best method to create a counter because it is currently the quickest
- CGI standard is generally the most compatible with today's browsers

#### **Advantages of CGI:**

- The advanced tasks are currently a lot easier to perform in CGI than in Java.
- It is always easier to use the code already written than to write your own.
- CGI specifies that the programs can be written in any language, and on any platform, as long as they conform to the specification.
- CGI-based counters and CGI code to perform simple tasks are available in plenty.

#### **Disadvantages**

**of**

**CGI:**

There are some disadvantages of CGI which are given below:

- In Common Gateway Interface each page load incurs overhead by having to load the programs into memory.
- Generally, data cannot be easily cached in memory between page loads.
- There is a huge existing code base, much of it in Perl.
- CGI uses up a lot of processing time.

URI(Uniform Resource Identifier)

Stands for "Uniform Resource Identifier." A URI identifies the name and location of a file or resource in a uniform format. It includes a string of characters for the filename and may also contain the path to the directory of the file. URIs provide a standard way for resources to be accessed by other computers across a network or over the World Wide Web. They are used by software programs such as Web browsers and P2P file-sharing programs to locate and download files.

URIs are similar to URLs in that they specify the location of a file. However, a URI may refer to all or part a URL. For example, Apple's iMac Design URL is <http://www.apple.com/imac/design.html>. The URI of this resource may be defined as just "design.html" or "/imac/design.html." These are called relative URIs since they identify the resource relative to a specific location. The complete URL would be referred to as an absolute URI.

Because URLs and URIs are similar, they are often used interchangeably. In most cases, this is acceptable since the two terms often refer to the same thing. The difference is that a URI can be used to describe a file's name or location, or both, while a URL specifically defines a resource's location.

Dreamweaver:

Dreamweaver is a proprietary web development tool first created by Macromedia in 1997. Dreamweaver helps developers build web sites for the Internet or an intranet, letting developers design, code and manage websites as well as mobile content. It is currently available for OS X and Windows.

Dreamweaver combines a visual design surface, known as Live View, and a code editor with features such as code collapsing, code completion and syntax highlighting.

- **Dreamweaver** allows **you** to build webpages by designing them visually in a LIVE view without knowing any HTML or if **you** know HTML code, type it into the code editor. Both approaches allow **you** to quickly build a webpage and ultimately a website.
- **Dreamweaver** is an offline-based software that can be helpful to seasoned developers and non-coding newbies alike. This program has an exhaustive set of tools that allows you to **design**, build, customise and manage your **websites**.
- **Dreamweaver** is not **relevant** in modern **web design**. ... The code behind **web** sites (html, css, javaScript) is so well structured now, and so much more powerful (HTML5 and CSS3 rock!) that you can easily put out great **websites** with relatively little coding – as compared to what is was like in the past.

### Unit-3Introduction to Internet Security

Internet security consists of a range of security tactics for protecting activities and transactions conducted online over the internet. These tactics are meant to safeguard users from threats such as hacking into computer systems, email addresses, or websites; malicious software that can infect and inherently damage systems; and identity theft by hackers who steal personal data such as bank account information and credit card numbers. Internet security is a specific aspect of broader concepts such as cybersecurity and computer security, being focused on the specific threats and vulnerabilities of online access and use of the internet.

In today's digital landscape, many of our daily activities rely on the internet. Various forms of communication, entertainment, and financial and work-related tasks are accomplished online. This means that tons of data and sensitive information are constantly being shared over the internet. The internet is mostly private and secure, but it can also be an insecure channel for exchanging information. With a high risk of intrusion by hackers and cybercriminals, internet security is a top priority for individuals and businesses alike.

Internet security refers to securing communication over the internet. It includes specific security protocols such as:

- Internet Security Protocol (IPSec)
- Secure Socket Layer (SSL)

#### Internet Security Protocol (IPSec)

It consists of a set of protocols designed by Internet Engineering Task Force (IETF). It provides security at network level and helps to create authenticated and confidential packets for IP layer.

## Secure Socket Layer (SSL)

It is a security protocol developed by Netscape Communications Corporation. ). It provides security at transport layer. It addresses the following security issues:

- Privacy
- Integrity
- Authentication

## Types of internet security threats

While the web presents users with lots of information and services, it also includes several risks. Cyberattacks are only increasing in sophistication and volume, with many cybercriminals using a combination of different types of attacks to accomplish a single goal. Though the list of potential threats is extensive, here are some of the most common internet security threats:

**Malware:** Short for "malicious software," malware comes in several forms, including computer viruses, worms, Trojans, and dishonest spyware.

**Computer worm:** A computer worm is a software program that copies itself from one computer to the next. It does not require human interaction to create these copies and can spread rapidly and in great volume.

**Spam:** Spam refers to unwanted messages in your email inbox. In some cases, spam can simply include junk mail that advertises goods or services you aren't interested in. These are usually considered harmless, but some can include links that will install malicious software on your computer if they're clicked on.

**Phishing:** Phishing scams are created by cybercriminals attempting to solicit private or sensitive information. They can pose as your bank or web service and lure you into clicking links to verify details like account information or passwords.

**Botnet:** A botnet is a network of private computers that have been compromised. Infected with malicious software, these computers are controlled by a single user and are often prompted to engage in nefarious activities, such as sending spam messages or denial-of-service (DoS) attacks.

## Authentication

To put it simply, authentication is the process that confirms a user's identity and provides access to sensitive information.

Traditionally, this is done through a username and password. The user enters their username, which allows the system to confirm their identity. This system relies on the fact that (hopefully) only the user and the server know the password.

The website authentication process works by comparing the user's credentials with the ones on file. If a match is found, the authentication process is complete, and the individual can be pushed through to the authorization process.

## **Types of authentication**

While password authentication is the most common way to confirm a user's identity, it isn't even *close* to the most effective or secure method.

Think about it: anyone with your credentials could access your account without your permission, and the system wouldn't stop them. Most passwords are weak, and hacking techniques can break them in less and less time.

Luckily, passwords aren't the only way to authenticate your users. That's why we'll cover two alternative methods that sites can use to verify a user's identity.

### ***Biometric Authentication***

Biometric authentication includes any method that requires a user's biological characteristics to verify their identity. While this may seem like new-age technology, you're probably been using it to unlock the screen on your smartphone for years. Fingerprint scanning is the most well-known form of biometric authentication, but facial recognition tools are an increasingly popular choice for developers and users alike.

Of course, hackers have a much more difficult time replicating a users' biological characteristics than typical password-based methods of authentication. However, it's important to note that these processes are often less secure than you might initially assume.

For example, small fingerprint scanners on smartphones only record portions of your fingerprint. Multiple images of part of a fingerprint are much less secure than a single, clear image. Plus, some hackers have created a "master fingerprint" that contains characteristics of most common prints, allowing them to trick the scanners.

Remember, too, that biometric authentication can't be changed or altered if a user's fingerprints have been compromised. While biometric authentication holds a lot of promise, it's really most useful as a second factor in a multi-factor authentication strategy.

### ***Email Authentication***

Email authentication is a passwordless option that allows users to securely log in to any account using just an email address. The process is very similar to signing in with a Facebook or Twitter account, but this method offers a more universal approach. After all, the vast majority of individuals in the U.S. have *at least* one email address.

## Authorization

Authorization is the next step in the login process, which determines what a user is able to do and see on your website. Once a user's identity has been verified through the authentication process, authorization determines what permissions they have.

*Permissions* are what the user is able to do and see on your website or server. Without them, every user would have the same abilities and access to the same information (including the sensitive data that belongs to another user). Permissions are crucial for a few reasons:

**They prevent a user from accessing an account that isn't theirs.**

Imagine if your online banking application didn't have permissions. When you logged in, you'd not only have access to your account but also every other user's account on the application! Permissions ensure users can access and modify only what they need to.

**They restrict free accounts from getting premium features.**

Let's say your website offers different feature packages. To restrict free accounts from gaining access to your premium features, you need to implement specific permissions so that each account only has access to the capabilities they paid for.

**They ensure internal accounts only have access to what they need.**

Your users aren't the only ones that need permissions— your staff accounts need them, too. Staff may have access to higher levels of data than the average users, but it's crucial to set restrictions for them as well. For example, users' contact information might be useful for your marketing team, but they should never be able to access your users' more private credentials.

Ensuring effective authorization and permission settings are essential for any website or application. In fact, setting the right permissions is just as important as using a secure authentication method.

Without dictating what users can see and do, your information is no safer than if there were no first layer of authentication at all. And while strategic authentication methods only require that a user verifies their identity a single time per session, authorization occurs with every request the user makes— starting with the initial login process.

### 3. Security authentication vs. authorization

Authentication and authorization are often discussed in tandem. However, it's important to recognize key distinctions between the two. In the login process as a whole, one step can't be completed without the other. Still, authentication must always come first.

**How are authentication and authorization different?**

The easiest way to understand this relationship is by asking yourself the questions, "Who are you?" and "What are you allowed to do?"

Just like it would be impossible to determine what an individual is allowed to do if you're not sure who they are, your registration and login systems cannot authorize users if they've yet to be authenticated.

In other words, authentication identifies users while authorization determines their permissions. While they're entirely different processes, they work together to ensure a seamless login experience for users— and neither one can be completed without the other!

## **How do authentication and authorization work together?**

Security authentication and authorization should be incorporated into any website or application, although it's especially vital for those that process online transactions or personal information.

Since anyone with the "key" can gain access, it's vital that companies implement a strong authentication strategy to keep unauthorized users from accessing accounts without permission.

### 4. Boosting security authentication and authorization

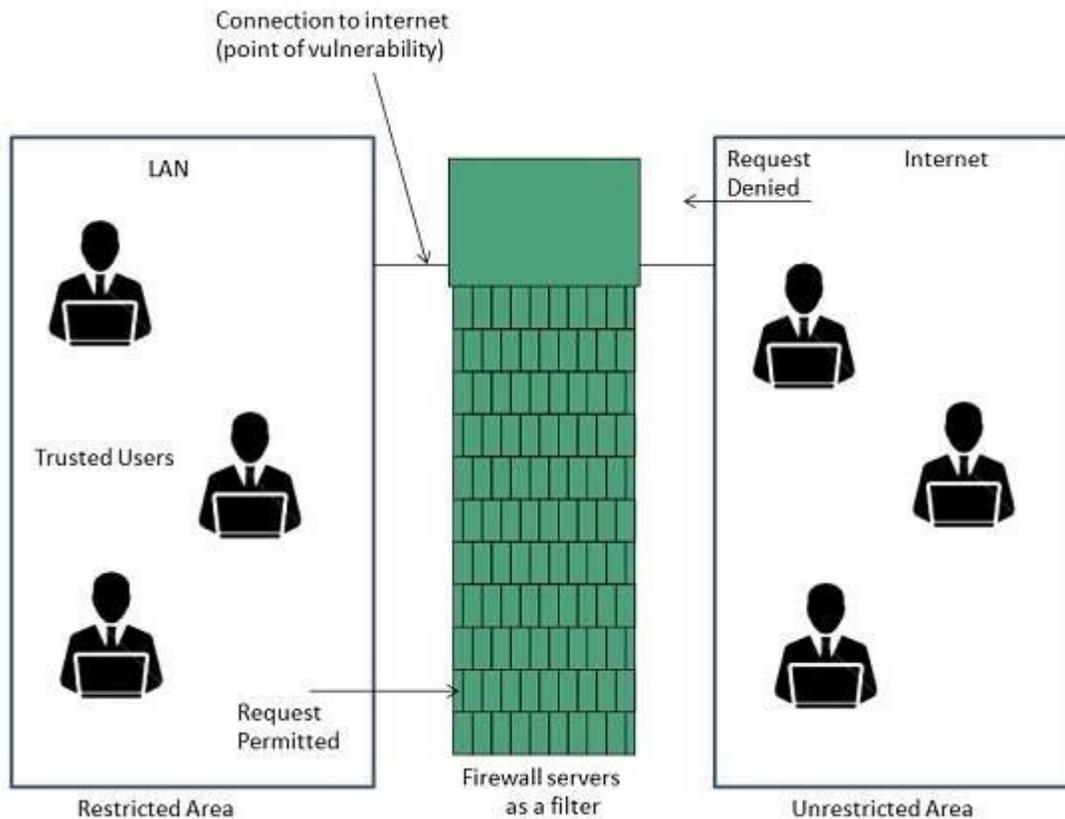
Authentication and authorization keep internal accounts organized and help catch unauthorized activity before it becomes a serious threat. **One of the main steps we recommend to protect against breaches is to make sure every account has only the permissions they need.** That way, your team can spot any unusual behavior early on and take the necessary steps to correct or shut it down.

Strong security authentication protocols prevent cybercriminals from gaining access to your accounts. Having a secure authentication method will make it more difficult for hackers to crack a users' key and gain access to their information.

### **Firewall :**

**Firewall** is a barrier between Local Area Network (LAN) and the Internet. It allows keeping private resources confidential and minimizes the security risks. It controls network traffic, in both directions.

The following diagram depicts a sample firewall between LAN and the internet. The connection between the two is the point of vulnerability. Both hardware and the software can be used at this point to filter network traffic.



There are two types of Firewall system: One works by using filters at the network layer and the other works by using proxy servers at the user, application, or network layer.

### Key Points

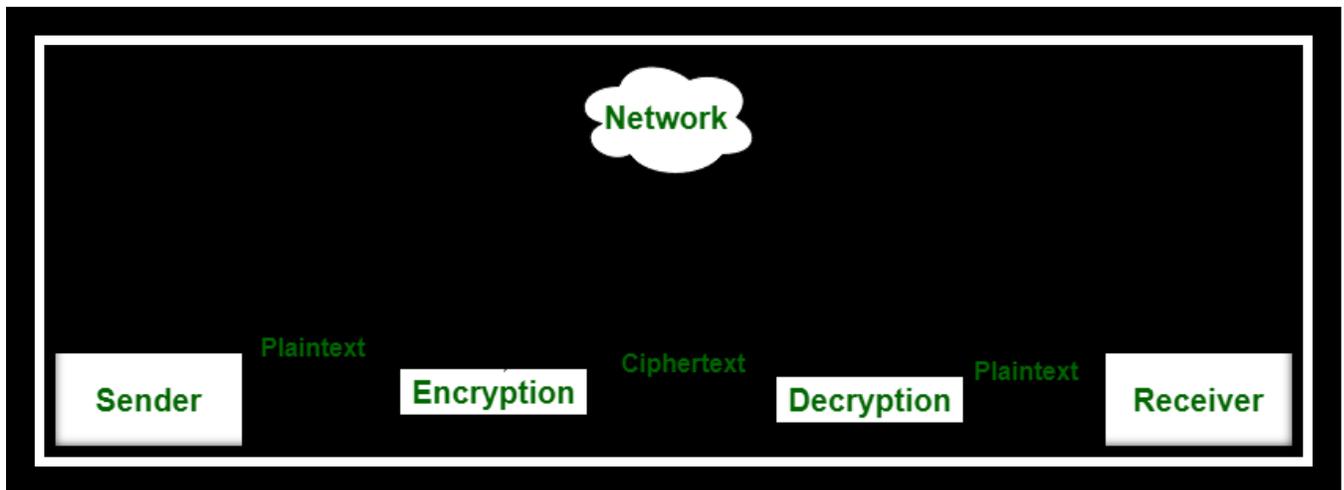
- Firewall management must be addressed by both system managers and the network managers.
- The amount of filtering a firewall varies. For the same firewall, the amount of filtering may be different in different directions.

### Difference between Encryption and Decryption

Last Updated: 31-03-2020

**Encryption** is the process of converting normal message (plaintext) into meaningless message (Ciphertext). Whereas **Decryption** is the process of converting meaningless message (Ciphertext) into its original form (Plaintext).

The major distinction between secret writing associated secret writing is that secret writing is that the conversion of a message into an unintelligible kind that's undecipherable unless decrypted. whereas secret writing is that the recovery of the first message from the encrypted information.



Let's see that the difference between encryption and decryption:

S.NO	ENCRYPTION	DECRYPTION
1.	Encryption is the process of converting normal message into meaningless message.	While decryption is the process of converting meaningless message into its original form.
2.	Encryption is the process which take place at sender's end.	While decryption is the process which take place at receiver's end.
3.	Its major task is to convert the plain text into cipher text.	While its main task is to convert the cipher text into plain text.
4.	Any message can be encrypted with either secret key or public key.	Whereas the encrypted message can be decrypted with either secret key or private key.

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<p>In encryption process, sender sends the data to receiver after encrypted it.</p> <p>5.</p>	<p>Whereas in decryption process, receiver receives the information(Cipher text) and convert into plain text.</p>
---	---

## SSL Authentication

SSL authentication stands for Secure Sockets Layer and is a protocol for creating a secure connection for user-server interactions.

All web interactions involve both a server and a user. Users often enter or have sensitive, personal information on sites that leave people and systems vulnerable. Having better authentication—particularly on sites that host financial, medical, or personal data—bolsters security and, like HIPPA, may meet significant legal security requirements. User interactions need to be stable, verifiable, and secure. The way that a server verifies that the user is a real person is by collecting information. There are a number of ways this can be done.

### Types of Authentication

Authentication can require various single or multiple ways for a user to authenticate who they are. A few of these ways are:

- Basic authentication, like multifactor authentication (passwords, PINs, etc.)
- Form-based authentication
- SSL authentication in RESTful web services
- OAuth

An SSL authentication encrypts the link between the server and the user, making it that much harder for unauthorized entities to gain access to sensitive information.

## SSL Authentication Process

The SSL authentication process involves a series of steps that a website owner and a server take together. In addition, having the correct protocols in place will grant a site an SSL Certificate.

1. A person accesses an SSL website through a browser. Then, the browser “introduces” the individual to a website. The browser collects and verifies information to ensure that the site is legitimate. If it’s a bad site, the browser will report back to you. Various servers have individualized alerts. Google Chrome users see this as a warning that a website might be trying to steal your identification.
2. If it’s a secure site, the site will present its SSL certificate. If that certificate is unexpired, it is encrypted and safe to use. This includes the server’s public key, which the browser replicates and sends back to the server.
3. When the server receives the copy of a site’s public key, it then starts the session with the website.

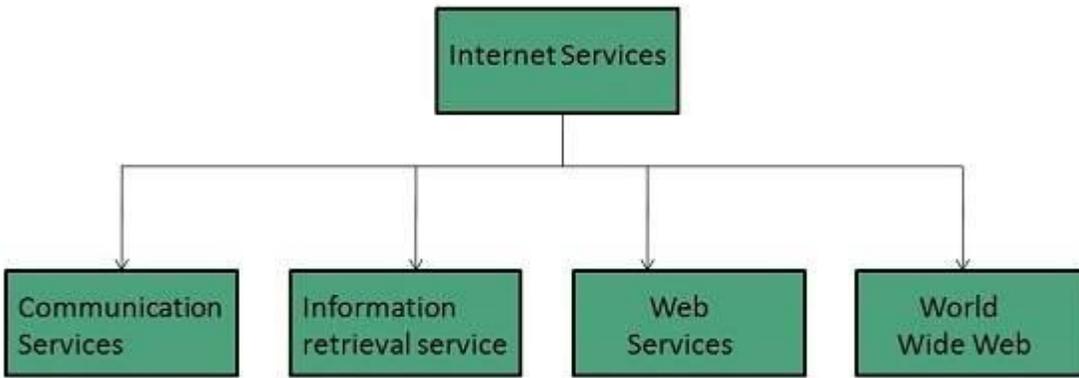
SSL also includes different validation levels, like:

- Extended validation certificates
- Organization validated certificates
- Domain validated certificates

Whether or not a site uses an SSL server is up to the host, however, it is common protocol to include this. Failure to include it could cost your site’s reputation. Fairly easy to maintain and continually use, SSL authentication keeps customers and websites secure.

### **Internet Services/Internet Application:**

**Internet Services** allows us to access huge amount of information such as text, graphics, sound and software over the internet. Following diagram shows the four different categories of Internet Services.



### Communication Services

There are various Communication Services available that offer exchange of information with individuals or groups. The following table gives a brief introduction to these services:

S.N.	Service Description
1	<b>Electronic Mail</b> Used to send electronic message over the internet.
2	<b>Telnet</b> Used to log on to a remote computer that is attached to internet.
3	<b>Newsgroup</b> Offers a forum for people to discuss topics of common interests.
4	<b>Internet Relay Chat (IRC)</b> Allows the people from all over the world to communicate in real time.
5	<b>Mailing Lists</b> Used to organize group of internet users to share common information through e-mail.
6	<b>Internet Telephony (VoIP)</b> Allows the internet users to talk across internet to any PC equipped to receive the call.

7	<p><b>Instant Messaging</b></p> <p>Offers real time chat between individuals and group of people. Eg. Yahoo messenger, MSN messenger.</p>
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### Information Retrieval Services

There exist several Information retrieval services offering easy access to information present on the internet. The following table gives a brief introduction to these services:

S.N.	Service Description
1	<p><b>File Transfer Protocol (FTP)</b></p> <p>Enable the users to transfer files.</p>
2	<p><b>Archie</b></p> <p>It's updated database of public FTP sites and their content. It helps to search a file by its name.</p>
3	<p><b>Gopher</b></p> <p>Used to search, retrieve, and display documents on remote sites.</p>
4	<p><b>Very Easy Rodent Oriented Netwide Index to Computer Achieved (VERONICA)</b></p> <p>VERONICA is gopher based resource. It allows access to the information resource stored on gopher's servers.</p>

### Web Services

Web services allow exchange of information between applications on the web. Using web services, applications can easily interact with each other.

The web services are offered using concept of **Utility Computing**.

### World Wide Web (WWW)

WWW is also known as W3. It offers a way to access documents spread over the several servers over the internet. These documents may contain texts, graphics, audio, video, hyperlinks. The hyperlinks allow the users to navigate between the documents.

## Video Conferencing

Video conferencing or Video teleconferencing is a method of communicating by two-way video and audio transmission with help of telecommunication technologies.

### Modes of Video Conferencing

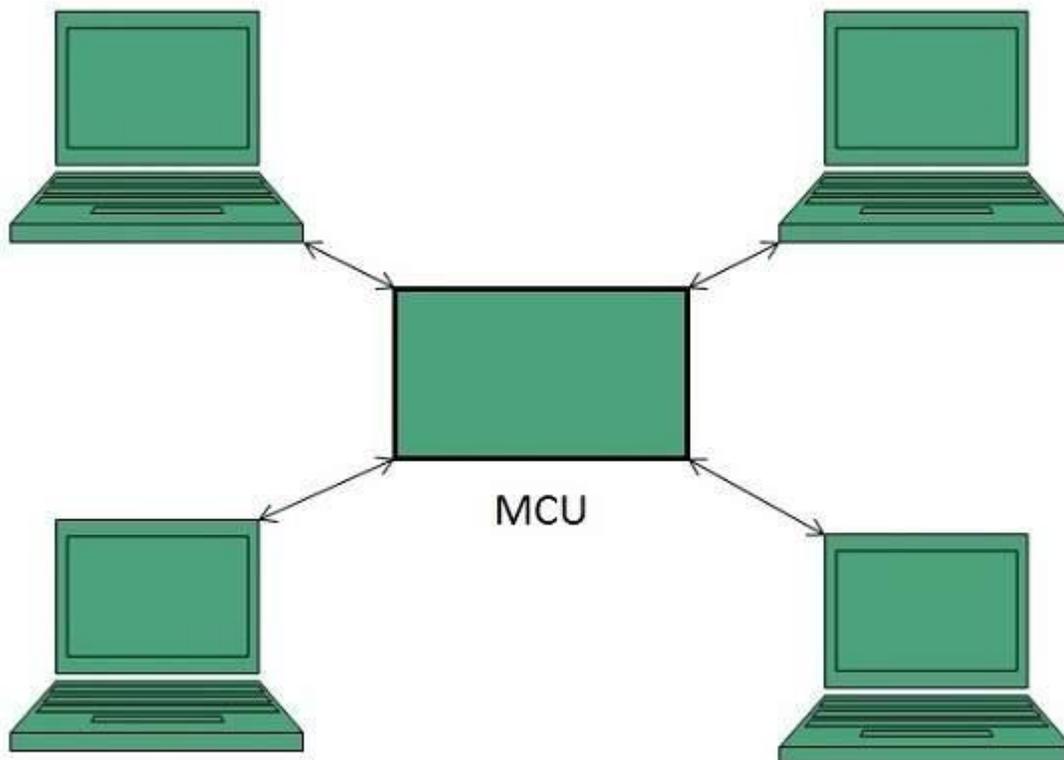
#### *Point-to-Point*

This mode of conferencing connects two locations only.



#### *Multi-point*

This mode of conferencing connects more than two locations through **Multi-point Control Unit (MCU)**.



**Chat rooms:**

**Chat rooms** are Web sites or programs that allow people to send text messages to one another in real time. ... Some examples of **chat rooms** are **Internet Relay Chat (IRC)** and Web sites such as Talk City (www.talkcity.com).

The primary use of a chat room is to share information via text with a group of other users. Generally speaking, the ability to converse with multiple people in the same conversation differentiates chat rooms from instant messaging programs, which are more typically designed for one-to-one **communication**.

Social platforms such as **chat rooms** can be dangerously addictive. They can not only hamper a student's academic life, but may also push them into a world of social aloofness. Eventually, such kids or teens may detach themselves from the real world.

### **Why Are Chat Rooms So Dangerous?**

- Targeting Kids. **Through a chat room**, a predator can engage a child and attempt to entice him out of the **chat room** into a private **room** or, in the worst case scenario, into a real life situation. ...
- Unmonitored Attendance. ...
- No Return on Investment. ...
- Bullying and Betrayal. ...
- Suspicious Sharing.

## E-COMMERCE

Allow customers to the online shop is today possible for everyone, however it is difficult to reach important results in the aggressive Internet market. Thanks to the development of many online stores, Sinte offers its customers turnkey solutions tailored to their needs. Sinte is able to design the ideal solution to contain and bear investment for each commercial reality, both the small retailer and the international wholesaler. The e-commerce solution is modular to fit all solutions and to evolve quickly responding readily Tomarket demands.

Sinte comes up with Intershop for companies wishing to enter the market with a complete package without particular customization needs. A study of the most important set of market has led to this software thanks to its extreme flexibility and customizability. Sinte has already internally developed a lot of proprietary customizations to meet the needs of its customers. Features:

- dynamic categories management with an unlimited number of features
- dynamic products management with an unlimited number of features
- dynamic template display management
- store and orders for its suppliers management
- customer by category management
- array of discounts management for products and customers type
- interface form with all most popular electronic payment systems (credit cards, prepaid, etc..)
- interface form with store software
- interface form with existing management and billing programs

### **What is the Difference between Website and Web Portal**

What is most confusing to people starting off their web journey is the difference between a **website** and a **web portal**. When asked to people who had layman knowledge on the subject, some were unable to hit the point, most of them said there was, however, no difference and there were some who had a very confused opinion on the subject. What we realized with our little experiment was people must understand deeply the concept of websites and web portals before they get all started on differentiating them, thus before we answer the title question; here is a close study on websites and web portals on their functionality, development process, frameworks popularly used to create them and their individual benefits.

### **What is a Website?**

When we google 'website', the very first definition we get from a reliable source such as Wikipedia is, 'a website is a collection of related web pages, including multimedia content, typically identified with a common domain name, and published on at least one web server.' To explain it further it is an interlinked collection of web pages grouped in various ways and together called as a website or simply a site.

However still there is a lot of confusion, isn't it? You might now ask what is a webpage? What is a web server? What is a domain name? etc. To drown out your confusion, a webpage is a document(page) or a hypertexted document connected to World Wide Web and can be displayed on a web browser like Chrome, Firefox, Internet Explorer, Edge, Safari, Opera, Bing, and others. A web server is web server is the computer that hosts the collection of web pages interlinked together or in one term we can say the website on the internet, on an identification string named as domain name.

Moving on further, for once since you have got a little idea of what is website lest start by finding why actually a website is made and why it is so essential part of a business journey, in short here is are some of the functions of website that will help you understand its participation in an online business.

### **Functions of Websites:**

- **Tell Your Story:** A website gives you the power to tell your clients about your services and products and help you engage them in long interaction to convince them to choose your company.
- **Answer FAQ's:** Websites help you resolve confusion or questions asked by new clients that further can also become your most potent clients base. Thus, including these questions on your website help you attract better client force while reducing your and your clients time.
- **Provide Clear Contact Details:** The contact us page on your website is a gateway of better client force, it allows your clients to investigate details about various ways to contact you like your email address, your office address, phone number etc. Quit traditional ways now to help your business reach out to your clients on a platform which is highly trusted by everyone.
- **Build Credibility** Build your website with a lot of professional edges, choose themes, functions, allow your websites to say it all about your products, services, your policies and your partnership and membership. In fact, you can also include a portfolio on your website that makes your clients rely more on you.
- **Expand Your Client Base:** With website and SEO activities you can increase your business visibility and create a good deal of client awareness around the globe.

- **Process of website Development** The right way of building a website or the web development company approach gives a lot of definition to your development. The right way to build a good website includes the following steps: 1. Information gathering 2. Planning 3. Brainstorming 4. Content Writing 5. Coding 6. Testing, Review and Launch.
- **Languages and Frameworks prominently used in developing websites:** Our technology and web development world from the very beginning has seen the emergence and downfall of many web development languages and frameworks, of which some still prevail and rule while some have become a history. Some of the most prominently used old, new, contemporary languages and frameworks are 1. Java 2. Ruby 3. Python 4. PHP 5. CSS etc.  
These are some of the most widely used languages, but that's not all they have different frameworks which makes development of different types of website easy. Some of them are 1. Django 2. Ruby on Rails 3. Symfony 4. Laravel 5. Bootstrap 6. CakePHP 7. Zend 8. CodeIgniter etc. You see the most widely used and trusted language is PHP which is recommended by many development companies and developers.

### What is Web Portal?

This might come as a confusion, but Web Portal is a specially designed website that provides information catered from various sources such as emails, online forums, search engines on one platform, in a uniform way. It is a personalized and customized library that help in navigation and personalization of notifications that provide a well-integrated information from diverse sources with advance features such as task management, collaboration, business intelligence etc.

### Functions of Web Portal

- **Upgrading your website** Web Portal development help you in improving the capability of the web pages that help you deliver a quality information, thus a web portal is the new world toolset that makes implementation of information better and behaves as a different communication approach.
- **Improves Relations immensely** It helps in enhanced customer-company relations as it helps in improving their customer relations by providing high-end and filtered information on a user-friendly and comprehensive platform.
- **Domain Specific** Domain Specific development of web portals helps you attract the users that seek information and services on that domain. Thus, helping you attract a particular area of domain.
- **Interaction** When done efficiently web portal design services help you a lot in interacting better with your customers and clients. They help you make your web pages very interactive and target better to your audience.
- **Process of web portal designing services** Web portal development and designing is a complex art as its functionality is highly difficult to render. The complex process of web portal development includes similar steps as website development. However, the difference is in its features, functionality, coding, testing and integration. Since we have covered the features and functionality let's start with the languages and frameworks that are used dominantly in web portal development services by eminent web portal development companies and web portal developers.
- **Languages and Frameworks prominently used in developing web portals** Since web portals are differently designed websites, the languages are similar that we use in

building and web designing services in a website development. Thus, the top 10 frameworks that we use in building web portals are 1. AngularJS 2. Laravel 3. ReactJS 4. NodeJS 5. Ruby on Rails 6. Symfony 7. Asp.Net 8. Yii 9. MeteorJS and 10. CakePHP.

### Now The difference between Website and Webportal

Websites and web portals thus can be differentiated on different aspects, firstly websites are majorly focused on driving traffic while web portals are for limiting the traffic. Whereas the web portals require users to login while websites are open to being visited by any individual.

Thus, on differentiating it based on their uses, a web portal is creating and attract a specific audience experience, control user's functionality on your page, multiple source integrations to provide uniform information and other user management and permitting features.

WEBSITE	WEB PORTAL
Location on internet, publically accessible with a unique URL(Web Address)	A private location on the internet it can be accessible with unique url and unique username and password
No any requirment of any login	Login required
Any one can visit and can see content of website	Only memeber of the webportal having access can see the content of web portal
Content does not change by different individuals	Dynamic content changes more frequently than typical websites

## WEBSITE

## WEB PORTAL

### Types:

---

Personal Websites

Personal

---

Photo Sharing Websites

Government

---

Writers / Authors  
Websites

Cultural

---

Community Building  
Websites

Corporate

---

Mobile Device Websites

Stock

---

Blogging Websites

Tender

---

Social Websites

Hosted,Domain specific

The major reason behind building websites is to deliver products and services that help you in managing its content, perform SEO activities, add visibility on the internet, operate functions etc.

### WrappingUp:

On final note we can say that differentiating websites and web portals can be a difficult task as both have same benefits, however, there functions draw a dark line between them which makes them clearly different from each other.

In attempt to clear your confusion, the above article is targeted to various sections of development of websites and web portals that will further help you differentiate both web development practices to endure better business benefits.

### Social networking sites (SNSs)

Social networking sites (SNSs) are virtual communities where users can create individual public profiles, interact with real-life friends, and meet other people based on shared interests. Anecdotal case study evidence suggests that “addiction” to social networks on the Internet may be a potential mental health problem for some users. However, the contemporary scientific literature addressing the addictive qualities of social networks on the Internet is relatively scarce.

SNSs are increasingly affecting mental and physical health of teenagers and young adults. Researchers and practitioners have proposed a number of strategies to combat the problem. There are three solutions: (1) education and awareness, (2) engagement in extracurricular activities, and (3) restrictions and limitations.

Human nature by default has been programmed to be socially active to a certain extent. Some people are more active, while others are less so!

However, people have always been looking for ways to connect and network with each other. And, in this age of digitisation, people have found ways to be socially active on the internet, which is possible with the advent of the numerous social networking platforms and apps.

Now, even relationships begin, grow and end on social media. People no longer need a personal handshake or face-to-face meeting.

Social media sites have also grown in numbers by leaps and bounds. As per the statistics revealed on Statista, approximately 2 billion users used social networking sites and apps in 2015. And, with the increased use of mobile devices, this number is likely to cross the 2.6 billion mark by 2018.

6 types of social media?

### **The Different Types Of Social Media Platforms To Serve Ads:**

- Social networking (Facebook, LinkedIn, Google+).
- Microblogging (Twitter, Tumblr).
- Photo sharing (Instagram, Snapchat, Pinterest).
- **Video** sharing (YouTube, Facebook Live, Periscope, Vimeo). Etc.

Learn More About These Popular Social Media Sites

## 1 – Facebook

This is easily the largest social networking site in the world and one of the most widely used. And, Facebook was perhaps the first that surpassed the landmark of 1 billion user accounts.

Apart from the ability to network with friends and relatives, you can also access different Facebook apps to sell online and you can even market or promote your business, brand and products by using paid Facebook ads.

Recently Facebook has lost the trust of millions of its users by allowing 3rd parties to access over 87 million users' personal data. This is a massive breach of trust and has created a feeling of unrest amongst the social media platform's audience. So much so that there is now a #deletefacebook campaign where people are completely removing themselves from Facebook and using other networks instead. If you're concerned about what Facebook is doing with your data, then why not check out my guide on [alternatives to Facebook](#), and see if there's a better place for you to interact with family and friends.

**Number of active users per month: 1.59 billion approximately**

## 2 – WhatsApp

Despite having been acquired by Facebook in 2014, this instant messaging platform exists as an independent entity.

It arrived on the scene much later than Facebook, but has been able to capture the imagination of millions of people across the world by giving them the ability to communicate and share instantly with individuals and groups. The WhatsApp call feature is just the icing on the cake!

**Number of active users per month: 1 billion approximately**

## 3- QQ

Tencent QQ (more popularly known as QQ) is an instant messaging (chat-based) social media platform. It became international (with more than 80 countries using it), after it was launched in China.

It can be used to stay in touch with friends through texts, video calls and voice chats. It even has a built-in translator to translate your chats. To find out more, head over to our [Chinese Social Media stats page](#).

**Number of active users per month: 853 million approximately**

## 4 – WeChat

This is an all-in-one communications app for messaging and calling (similar to WhatsApp) that enables you to connect with the people of your choice. It was also developed by Tencent in China and can easily work alongside QQ. As per the [BI intelligence report](#), the number of WeChat users are fast catching up with the number of WhatsApp users.

Related article: [WeChat keyboard shortcuts](#)

**Number of active users per month: 697 million approximately**

## 5 – QZone

Like QQ and WeChat, QZone is yet another social networking service developed by Tencent. It enables you to share photos, watch videos, listen to songs, write blogs, maintain diaries and so

on. It also empowers you to choose the accessories and customize the look and feel of your QZone webpages.

**Number of active users per month: 640 million approximately**

6 – Tumblr

Having been owned by Yahoo since 2013, Tumblr serves as a social media cum micro blogging platform that can be used to find and follow things that you like. You can also use it to post anything, including multimedia, to a short-form blog. Moreover, it gives you the flexibility to customize almost everything.

**Number of active users per month: 555 million approximately**

7 – Instagram

Instagram was launched as a unique social networking platform that was completely based on sharing photos and videos. This photo sharing social networking app thus enables you to capture the best moments of your life, with your phone's camera or any other camera, and convert them into works of art.

This is possible because Instagram allows you to apply multiple filters to your photos and you can easily post them to other popular social networking sites, such as Facebook and Twitter. It is now part of the Facebook empire. Learn how to grow your Instagram audience.

Read more on Instagram Tools to help you increase social engagement and audience numbers.

**Number of active users per month: 400 million approximately**

8 – Twitter

This social networking site enables you to post short text messages (called tweets), containing a limited number of characters (up to 280), to convey your message to the world. With the growing craze for online shopping, Twitter also makes it possible to promote your businesses and even shop directly through tweets. Learn how to create the perfect Twitter profile.

**Number of active users per month: 320 million approximately**

9 – Google+ ( No Longer Available )

Owned by the tech giant Alphabet (Google), this interest-based social networking platform enables you to stay in touch with people by sharing messages, photos, videos, useful links to sites and so on. It also extends support for video conferencing through Hangouts and allows businesses to promote their brands and products through Google+ business pages.

**Number of active users: 300 million approximately**

10 – BaiduTieba

Offered by Baidu of China, a search engine company, BaiduTieba (known as Postbar internationally) is a social forum network based on the keyword searches in the Baidu search engine. This discussion forum works on the unique concept of allowing you to create a social network group for a specific topic, using the search, or even to join an existing online social group.

**Number of active users per month: 300 million approximately**

11 – Skype

Skype, owned by Microsoft, is one of the most popular communication-based social networking platforms. It allows you to connect with people through voice calls, video calls (using a webcam) and text messaging. You can even conduct group conference calls. And, the best part is that

Skype-to-Skype calls are free and can be used to communicate with anyone, located in any part of the world, over the internet.

**Number of active users per month: 300 million approximately**

**social networking sites used for:**

**Social networking sites** allow users to share ideas, digital photos and videos, posts, and to inform others about online or real-world activities and events with people in their **network**.

## **RSS**

RSS is an open method for delivering regularly changing web content. Many news-related sites, weblogs, and other online publishers syndicate their content as an RSS Feed to whoever wants it.

Any time you want to retrieve the latest headlines from your favorite sites, you can access the available RSS Feeds via a desktop RSS reader. You can also make an RSS Feed for your own site if your content changes frequently.

In brief:

- RSS is a protocol that provides an open method of syndicating and aggregating web content.
- RSS is a standard for publishing regular updates to web-based content.
- RSS is a Syndication Standard based on a type of XML file that resides on an Internet server.
- RSS is an XML application, which conforms to the W3C's RDF specification and is extensible via XML.
- You can also download RSS Feeds from other sites to display the updated news items on your site, or use a desktop or online reader to access your favorite RSS Feeds.

**What does RSS stand for?** It depends on what version of RSS you are using.

- **RSS Version 0.9** - Rich Site Summary
- **RSS Version 1.0** - RDF Site Summary
- **RSS Versions 2.0, 2.0.1, and 0.9x** - Really Simple Syndication

What is RSS Feed?

- RSS Feed is a text XML file that resides on an Internet server.
- An RSS Feed file includes the basic information about a site (title, URL, description), plus one or more item entries that include - at a minimum - a title (headline), a URL, and a brief description of the linked content.

- There are various flavors of RSS Feed depending on RSS Version. Another XML Feed format is called ATOM.
- RSS Feeds are registered with an RSS registry to make them more available to viewers interested in your content area.
- RSS Feeds can have links back to your website, which will result in a high traffic to your site.
- RSS Feeds are updated hourly (Associated Press and News Groups), some RSS Feeds are updated daily, and others are updated weekly or irregularly.

### How Does RSS Work?

This is how RSS works:

- A website willing to publish its content using RSS creates one RSS Feed and keeps it on a web server. RSS Feeds can be created manually or with software.
- A website visitor will subscribe to read your RSS Feed. An RSS Feed will be read by an RSS Feed reader.
- The RSS Feed Reader reads the RSS Feed file and displays it. The RSS Reader displays only new items from the RSS Feed.
- The RSS Feed reader can be customized to show you content related to one or more RSS Feeds and based on your own interest.

### News Aggregators and Feed Readers

RSS Feed readers and news aggregators are essentially the same thing; they are a piece of software. Both are used for viewing RSS Feeds. News aggregators are designed specifically to view news-related Feeds but technically, they can read any Feeds.

### Who can Use RSS?

RSS started out with the intent of distributing news-related headlines. The potential for RSS is significantly larger and can be used anywhere in the world.

Consider using RSS for the following:

- **New Homes** - Realtors can provide updated Feeds of new home listings on the market.
- **Job Openings** - Placement firms and newspapers can provide a classified Feed of job vacancies.
- **Auction Items** - Auction vendors can provide Feeds containing items that have been recently added to eBay or other auction sites.
- **Press Distribution** - Listing of new releases.
- **Schools** - Schools can relay homework assignments and quickly announce school cancellations.

- **News & Announcements** - Headlines, notices, and any list of announcements.
- **Entertainment** - Listings of the latest TV programs or movies at local theatres.

RSS is growing in popularity. The reason is fairly simple. RSS is a free and easy way to promote a site and its content without the need to advertise or create complicated content sharing partnerships.

### **Blog:**

A blog is a type of website where the content is presented in reverse chronological order (newer content appear first). Blog content is often referred to as entries or “blog posts”.

Blogs are typically run by an individual or a small group of people to present information in a conversational style. However, now there are tons of corporate blogs that produce a lot of informational and thought-leadership style content.

Typical blog posts also have a comments section where users can respond to the article.

### ***History of Blogs***

Blogs evolved from online diaries and journals in the mid-90s. At that time, internet users were already running personal web pages where they published regular updates about their personal lives, thoughts, and social commentary.

The term web log was first used during the late 90s, which later became ‘weblog’, then ‘we blog’, and finally just ‘blog’.

Due to the growing number of such web pages, several tools started to appear, which made it easier for users to create online journals and blogs. These tools helped popularize blogging and made the technology accessible to non-technical users.

In 1999, the popular blogging website Blogger.com was launched, which was later acquired by Google in February 2003.

The same year, WordPress released its first version as a blogging platform in May 2003.

Today, WordPress is the world’s most popular blogging platform powering over 30% of all websites on the internet.

### ***What is The Difference Between Blog and Website?***

Blogs are a type of website. The only real difference between a blog and other types of website is that blogs are regularly updated with new content, which is displayed in reverse chronological order (newer posts first).

Typical websites are static in nature where content is organized in pages, and they are not updated frequently. Whereas a blog is dynamic, and it is usually updated more frequently. Some bloggers publish multiple new articles a day.

Blogs can be part of a larger website. Often businesses have a blog section where they regularly create content to inform and educate their customers.

You can use WordPress to create both, a website and blog, that’s why a lot of business owners use WordPress to build their small business website.

In simple terms, all blogs can be a website or part of a website. However, not all websites can be called blogs.

For example, WPBeginner is a blog and a website. Our website has other content which is published in a non-blog format like glossary, about us, and contact pages.

Now, let’s take a look at another example. This time a website called Awesome Motive. It is a business website and belongs to WPBeginner’s management company.

It does not have a blog or any content published in sequential order. It uses pages to organize and present information about a business and collects user feedback by adding a contact form.

You can also say that blogs have articles that are organized using categories and tags. On the other hand, websites use pages to organize and display content.

### ***Blog or Website – Which One is Better?***

As a beginner, you may be wondering whether you should start a blog or a website, which one is better? To be honest, the answer to this question really depends on what your goals are.

Many small businesses around the world have traditional websites made up of just pages and no blog. Such small websites are often made to create an informational web presence for a business, organization, or individual.

On the other hand, more and more businesses are realizing the potential of a blog in their marketing strategy. They are adding a separate blog section to their traditional websites and using it to get more traffic from search engines.

Take [OptinMonster](#), it is a lead generation software and their website has traditional sales pages showcasing their product and its features.

They also have an informational blog where they teach users how to improve conversions and get more leads. This helps them cover their industry keywords to get free traffic from search engines and make more sales.

Even if you are a business, a non-profit organization, or a professional, adding a blog to your website can help you achieve your goals.

### **What is The Difference Between Blog Posts and Pages?**

WordPress is the most popular blogging platform and a powerful content management system. By default, it comes with two content types: posts and pages. Often beginners get confused between the two.

Blog posts are displayed in a reverse chronological order (newest to oldest) on your blog page because they are timely content which means your users will have to dig deeper to view older posts.

Pages are static “one-off” type content such as your about page, contact page, products or services pages, home page, and more.

To learn more, see our beginner’s guide on the difference between posts and pages.

Pages are usually used to create a website structure and layout. Even blogs can have pages alongside them (See our list of important pages that every blog should have).

### **Why Do People Blog? What are The Benefits of Blogging?**

Each individual blogger has their own motivation for blogging. Many of them use it as an alternative to keeping a diary or journal. Blogging provides them with a venue to share their creativity and ideas to a wider audience.

Top brands and businesses create blogs to educate their customers, share news, and reach a wider audience. Blogging is an essential part of online marketing strategy for many businesses.

Following are just a few benefits of blogging.

- Provides an avenue to organize your thoughts and ideas
- Allows you to showcase your skills, creativity, and talents
- Help individuals become an authority in their industry
- Helps you socialize with interesting like-minded people online

- Many bloggers make money from their blogs using various monetization methods
- Businesses use blogging to bring more potential customers to their websites
- Non-profits can use blogs to raise awareness, run social media campaigns, and influence public opinion

### **What are Some Examples of Good Blogs?**

Blogging is huge!

Millions of individuals and businesses from all over the world have blogs. This means that there are blogs on just about any topic you can think of.

Here are some good blogs that you can check out as an example. We have hand-picked the best blogs in different industries to give you an idea of how diverse blogs are.

1. **Pinch of Yum**: It is one of the most popular food and recipe blogs online. Started by Lindsay, a high school teacher, the blog allowed her to quit her day job and become a full-time blogger.
2. **WeTheParents**: It is a popular parenting blog run by Neve and Keane (the parents). They share parenting tips for moms and dads and while doing so they make money by earning commission on products they recommend.
3. **We Wore What** : It is a popular fashion blog. With more than 1.5 Million followers, it covers everything from fashion to interior design to menswear.
4. **A fitness blog** : It started by Steve Kamb, Nerd Fitness is dedicated to helping people stay fit. It provides fitness advice, motivation, support, diet and exercise tips.
5. **Lost with purpose**: A popular travel blog run by Alex, who shares her journeys while offering travel tips, advice, and guides for other backpackers.
6. **Tiny Buddha**: It is a personal development blog created by Lori Deschene. The blog publishes content on happiness, love, relationships, mindfulness, spirituality, simplicity, minimalism, letting go, and more.

### ***How Do Bloggers Make Money?***

Usually, people think of bloggers as hobbyists. Some of them are, but a large number of bloggers make money from their blogs. This enables them to focus more on their blog, quit their day jobs, and build successful online businesses.

The more successful bloggers can make six-figure, seven-figure, and even eight-figure incomes from their blogs.

Below are a few ways that most bloggers use to make money from their blogs:

The most common and probably the easiest way to make money online is by displaying ads. However, as a new blogger, you will not be able to contact advertisers directly or manage them on your own.

This is where Google AdSense comes in. It takes care of finding ads, displaying them, collecting payments from advertisers, and sending you those payments for a small cut.

Many bloggers also make money through affiliate marketing. Basically, they recommend products on their websites and earn a commission when users buy those products.

Other common monetization methods include memberships, selling online courses, or adding an online store to the blog.

See our list of proven ways to make money online from your blog for some more examples.

We also have a list of “easy-to-start” online business ideas that you can check out.

### ***Can Anyone Start a Blog?***

Yes, anyone who wants to start a blog, can easily do so.

In the early days of blogging, users needed coding skills to even update their blogs. Now, there are plenty of tools that allow you to easily create a blog without ever writing code. If you can point-and-click, then you can build a blog within minutes.

### **Netiquette**

Shorthand for network etiquette, and is the set of rules that determines how to properly communicate and browse the web.

**One important part of netiquette concerns your online safety.** By following these basic rules and tips you will avoid most online threats such as phishing attempts, malware infections and more. *Why is this important for us?* Given the rise of cybercriminal activity in recent years, the need to stay safe on the Internet has never been more pronounced. Most people believe all they need to be secure online is to have an antivirus program and do frequent back-ups, but the truth is, cybercriminals know lot of ways around these. **What really keeps you safe is the ability to recognize online threats and how to avoid them, and this is why netiquette is so important.** A study from University of Maryland University College analyzed users’ knowledge on cyber-security and came up with a few interesting conclusions:

- the more you know about cybersecurity, the likelier you are to adopt online safety measures;
- cybersecurity training and education will make you more open to new online safety methods.

You can find tools to keep you secure, but ultimately, the best weapons are the ones you don’t use. Netiquette is important, so here are the **10 best internet safety tips and netiquette rules** you need to be aware of when online.

#### **1. Keep your software/apps updated and delete the ones you don’t use.**

Developers and cybercriminals are almost always caught in a cat and mouse game, where cybercriminals search for exploits and developers rush to patch them before too much damage is done. Most of the times, vulnerabilities are quickly updated, but the real issue is that most users will still use an outdated version and will be vulnerable to the exploit. Keeping your software up-to-date will go a long way into keeping you safe. But an equally important step is to remove software and apps you no longer use. Many of these programs still communicate in the background with various servers, and in case of a breach, this data might fall into the wrong hands.

#### **2. Be careful when dealing with emails from unknown sources**

*Have you received an email from an unknown source? Do you frequently receive -mails from people you don't know?* Just as in real life, an important rule to stay safe on the internet is to **be suspicious of strangers**. First, don't trust emails from people you never met, especially those that ask you to click a link, open an attachment or send a file to the sender. It's pretty easy to **spot phishing emails**. What gives most of the away is **the urgency with which they ask you to do something**, either because your account may be compromised or your online purchase may have encountered some issues you need to sort. To fool the potential victims, the latest trend in e-crime is to deploy **spear phishing attacks**, where emails appear to come from well-known individuals or banking authority. But in order for a spear phishing attack to be successful, it needs to appear as genuine and believable. So they launch an elaborate **identity theft operation** to target and steal your sensitive information. So when you do get a phishing email, ignore it completely and:

- don't reply to the e-mail
- don't click the (malicious) attachment
- don't click the dangerous links in the e-mail that could download malware on the system

### **3. Don't click that link or online ad**

You found a pretty cool link on the Internet and it keeps tempting you to click it. But the source of the link (website or email) seems fishy. You ask yourself: *What can the bad guys do to me if I click this link?* The answer is simple: **a lot of things could go wrong**. Just by clicking a link in an email or a pop-up window, you could turn your PC into a **botnet slave**, allow cybercriminals to inject malware into your device, or expose your personal information. You may think that you are safe from all these dangers because you have a **good antivirus product**, but nowadays **traditional antivirus protection isn't enough anymore** and you need **additional weapons** in the fight against online dangers.

### **4. Just because it's free, it doesn't mean it's safe**

As a rule of thumb, paid software is almost always secure and safe. It wouldn't make sense for a cybercriminal to limit the number of victims by imposing a paywall. *Double check free software using Google, especially if it's not a well-known one, such as WinRAR*. This filtering process can expose bad reviews, or reveal that the free software is actually a vehicle for malware. While the free software itself might be safe and legit, the website itself may try to compromise your security through **drive-by downloads**. These are secret downloads carried in the background, that target **software vulnerabilities and system exploits**. Make sure you use a trusted, free program that automatically updates your vulnerable software applications to close security holes in your system.

## 5. Do not reveal sensitive information online

**Social media is the first place criminals check to gather information on you.** They will use any piece of information they can find, such as your name, birthdate, address, city, your spouse/partners name, what sort of pet you have, name of the pet. Literally, anything that you can think of. Improving your **social media security settings** is a good first step in preventing an **identity theft** or **doxing**. So, be a bit skeptical about people you meet online and about their intentions. Many people exaggerate their Facebook lives, and depending on how you use it, social media may come back to **haunt you**.

## 6. Keep your account information for yourself

Our credentials for online accounts, user names and passwords, hold the keys to a lot of important information, and for that reason they are the most sought after targets by cybercriminals. Using the same password for more than one site is a risky move, since if a malicious hacker breaks into just one account, he can then take over the others. One of the better online safety tips is to use a different password for every website you register. The downside however is the difficulty of memorizing them. One workaround is to use password managers, these will remember the login details of every site you use and can even generate some strong password for you use. The one we recommend the most, both for its features and ease of use, is **LastPass**. You will only need to remember the master password for LastPass itself.

## 7. Report illegal activities or offending content

If you notice offending language attacks, like cyber-bullying, hate speech or any form of harassment, **do not hesitate to report it**. Using the “Flag as offensive” or “Flag as spam” buttons is proper internet etiquette and should be sufficient to fight back against minor online threats, but other types of content, such child pornography or arms trafficking should be immediately reported to the police. Reporting cyberbullying is takes on a different importance when children are the targets. A **report** on cyber bullying on 2014 gives the following troublesome conclusions:

- 25% of teenagers report that they have experienced repeated bullying
- **52% off young people report being cyber bullied**
- 95% of teens who witnessed bullying on social media report they have ignored the behavior
- **cyber bullying affects everyone**
- the most common types of cyber bullying tactics reported are mean, hurtful comments.

**So, if you see it, report it.** The consequences for cyberbullying can be quite severe, depending on the victim. In rare cases, cyberbullying has been known to push people into suicide. That's why it's so important to report it when children are involved.

## **8. What you post online stays online forever**

We post photos, remarks, location updates and similar content, which we think is fine because we use an anonymous username on a small niche forum. But niche forums are also indexed by search results, and if you reuse the username, other people can start to connect the dots. This is called doxxing, where people hunt for information about an internet user until they manage to figure out **who they are in real life**. And you may think that your posts and comments are usually ignored or don't receive much attention, but they still remain there and you never know when they come back at you. Not to mention the fact that search engines save and classify your content on so many online servers. But if you live in the EU, you benefit from a so called "right to be forgotten", which will prevent search engines from showing things about your past. Here's how you can **benefit from this right**. To keep it short, when it comes to posting personal content on forums and similar places, follow these guidelines:

- is this information too personal?
- delete/edit past posts which reveal too much about you
- could your content affect your personal or professional life in the future?

## **9. Use anti malware protection before you go online**

Don't go online until you have the best **anti-malware protection** that money can buy. You may think that avoiding adult websites and that sort of thing will keep you safe, but *did you know that hackers now hide malicious code even in legitimate websites?* And sometimes not even that is enough. Some **ransomware programs** are so sophisticated, it is technologically impossible to decrypt them, no matter how much you try. And in this case, you really need the best tools out there.

## **10. Create back-up copies for your important stuff**

Though you may have all the security protection in the world, disaster may still hit your system and your valuable files. It may be a system crash, a hard disk failure, a ransomware attack that encrypts your entire operating system or it may be a human mistake. There are so many reasons something can go wrong for you and your sensitive information, even if you followed all the netiquette rules in the book. To emphasize the importance of this point, we can tell you that a while ago we interviewed a series of **security experts** in the IT industry, and one recurring theme was the importance of **backing up your information**.

## **Introduction to Design a webpage**

Web design is the visual aesthetics and page layout of a website. It goes hand-in-hand with **web development** in the creation of a static website or dynamic web application.

Even if you don't consider yourself a creative person, it's still a good idea to learn web design. No matter whether you want to **make static websites** or dynamic web applications, design is an important part of the process. The design is the first thing people notice when they arrive on a website, and if it's not good enough, they'll leave. You don't want to create a site that frustrates people, do you?

If you do identify yourself as a creative person, you might even consider a career as a web designer. Today, there is a huge need for competent web designers with up-to-date skills. It's not an opportunity to be sneezed at.

### **Web Design Overview**

The web design process starts with a visual concept, which you could sketch by hand or with software like Photoshop. Then, you use **HTML** and **CSS** to build the website. HTML and CSS are the codes for writing web pages. HTML handles the basic structure and 'bones' of your page, while CSS handles the style and appearance.

If you're a good web designer, you'll also pay attention to concepts like responsive design, aesthetics, usability and accessibility when building your site.

## **PRINCIPLES OF GOOD WEBSITE DESIGN**

An effective website design should fulfill its intended function by conveying its particular message whilst simultaneously engaging the visitor. Several factors such as consistency, colours, typography, imagery, simplicity and functionality all contribute to good website design.

When designing a website there are many key factors that will contribute to how it is perceived. A well designed website can help build trust and guide visitors to take action. Creating a great user experience involves making sure your website design is optimised for usability (form and aesthetics) and how it easy is it to use (functionality).

Below are some guidelines that will help you when considering your next web project.

### **1. WEBSITE PURPOSE**

Your website needs to accommodate the needs of the user. Having a simple clear intention on all pages will help the user interact with what you have to offer. What is the purpose of your website? Are you imparting practical information like a 'How to guide'? Is it an entertainment website like sports coverage or are you selling a product to the user? There are many different purposes that websites may have but there are core purposes common to all websites;

1. Describing Expertise
2. Building Your Reputation
3. Generating Leads
4. Sales and After Care

## 2. SIMPLICITY

Simplicity is the best way to go when considering the user experience and the usability of your website. Below are ways to achieve simplicity through design.

### ***Colour***

Colour has the power to communicate messages and evoke emotional responses. Finding a colour palette that fits your brand will allow you to influence your customer's behaviour towards your brand. Keep the colour selection limited to less than 5 colours. Complementary colours work very well. Pleasing colour combinations increase customer engagement and make the user feel good.

### ***Type***

Typography has an important role to play on your website. It commands attention and works as the visual interpretation of the brand's voice. Typefaces should be legible and only use a maximum of 3 different fonts on the website.

### ***Imagery***

Imagery is every visual aspect used within communications. This includes still photography, illustration, video and all forms of graphics. All imagery should be expressive and capture the spirit of the company and act as the embodiment of their brand personality. Most of the initial information we consume on websites is visual and as a first impression it is important that high quality images are used to form an impression of professionalism and credibility in the visitor's mind.

## 3. NAVIGATION

Navigation is the way finding system used on websites where visitors interact and find what they are looking for. Website navigation is key to retaining visitors. If the website's navigation is confusing visitors will give up and find what they need elsewhere. Keeping navigation simple, intuitive and consistent on every page is key.

## 4. F-SHAPED PATTERN READING

The F-shaped pattern is the most common way visitors scan text on a website. Eye tracking studies have found that most of what people see is in the top and left area of the screen. The F-shaped layout mimics our natural pattern of reading in the West (left to right and top to bottom). An effectively designed website will work with a reader's natural pattern of scanning the page.

## 5. VISUAL HIERARCHY

Visual hierarchy is the arrangement of elements in order of importance. This is done either by size, colour, imagery, contrast, typographically, whitespace, texture and style. One of the most important functions of visual hierarchy is to establish a focal point; this shows visitors where the most important information is.

## 6. CONTENT

An effective web design has both great design and great content. Using compelling language great content can attract and influence visitors by converting them into customers.

## 7. GRID BASED LAYOUT

Grids help to structure your design and keep your content organised. The grid helps to align elements on the page and keep it clean. The grid based layout arranges content into a clean rigid grid structure with columns, sections that line up and feel balanced and impose order and results in an aesthetically pleasing website.

## 8. LOAD TIME

Waiting for a website to load will lose visitors. Nearly half of web visitors expect a site to load in 2 seconds or less and they will potentially leave a site that isn't loaded within 3 seconds. Optimising image sizes will help load your site faster.

## 9. MOBILE FRIENDLY

More people are using their phones or other devices to browse the web. It is important to consider building your website with a responsive layout where your website can adjust to different screens.

Web Development Roadmaps

Front-End Roadmap

STEP 1 Learn the Basics

Every **Web Developer** must have a basic understanding of **HTML**, **CSS**, and **JavaScript**.

**Responsive Web Design** is used in all types of modern web development.

**ECMAScript 5** (JavaScript 5) is supported in all modern browsers. Take a good look at it, especially the new array functions.

HTML	CSS	JavaScript
<u>HTML</u>	<u>CSS</u>	<u>JavaScript</u>
<u>HTTP / XHR</u>	<u>CSS Responsive</u>	<u>ECMAScript 5</u>

STEP 2 Dig Deeper

When you feel comfortable with **HTML** and **CSS**, it is time to dig deeper.

You should learn how to use **Maps**, **Fonts** and **Icons** in HTML.

On the **JavaScript** side, you should learn how to access the **HTML DOM**.

You should also learn how to use **AJAX** and **JSON** for making server requests.

HTML	CSS	JavaScript
HTML <u>DOM</u>	<u>CSS Icons</u>	<u>XML</u>
<u>Google Maps</u>		<u>JSON</u>
<u>Google Fonts</u>		
<u>Google Charts</u>		<u>AJAX</u>

STEP

Choose Frameworks

3

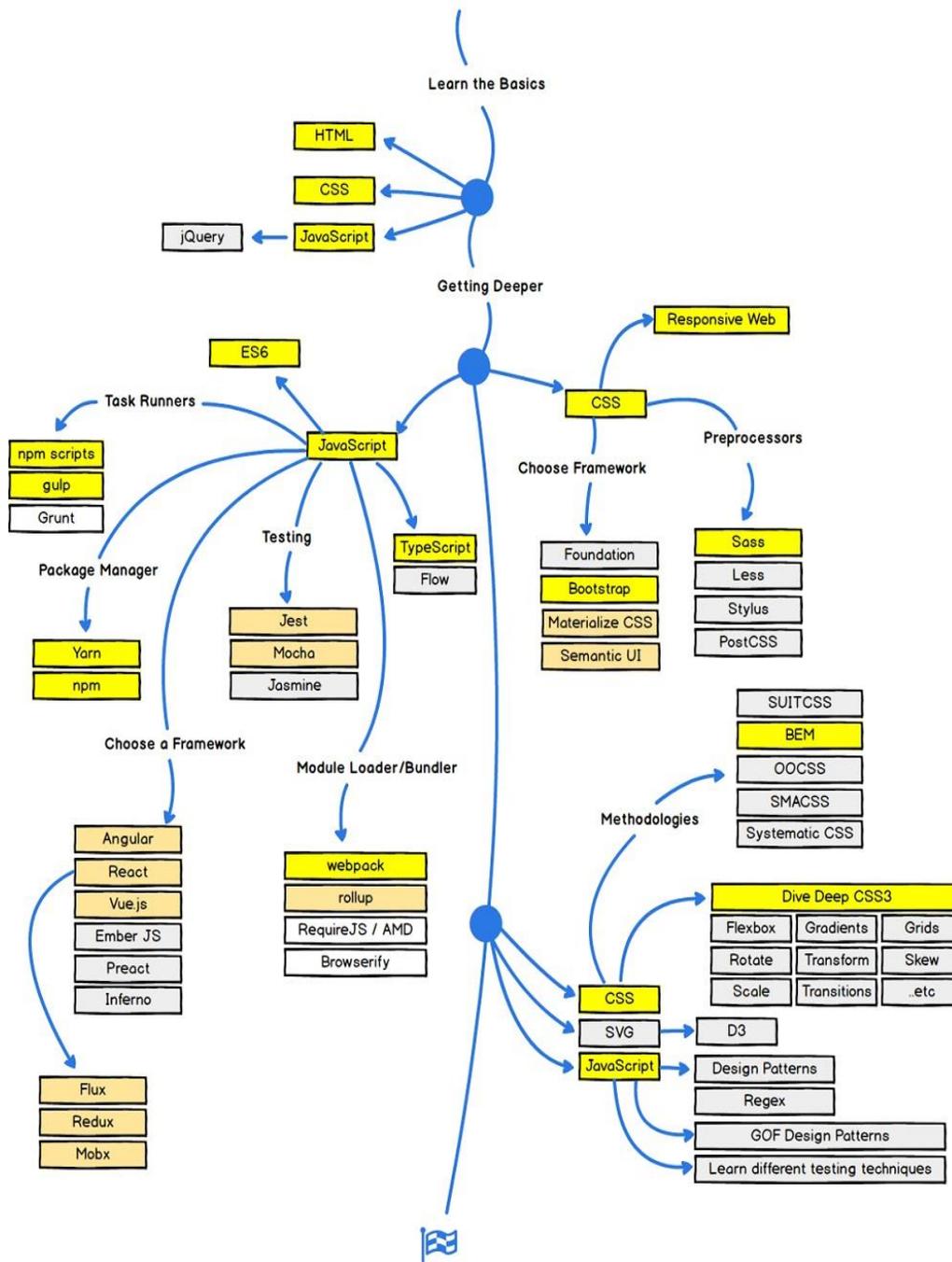
Now it is time to look at some **Frameworks**.

On the **CSS** side you should choose a framework for responsive web design: **Bootstrap** / **Material Design** / **W3.CSS**

On the **JavaScript** side you should learn at least one modern framework:  
**React.js / Angular.js / Vue.js / W3.JS**

Maybe the popularity of **jQuery** has passed the top, but it is still the most used JavaScript framework.

CSS	JavaScript	XML
<u>Bootstrap</u>	<u>jQuery</u>	XSL
<u>W3.CSS</u>	<u>AngularJS</u>	<u>XPath</u>
	<u>Vue.js</u>	<u>XQuery</u>
	<u>W3.JS</u>	



## Back-End Roadmaps

### STEP 4 Back-End Roadmaps

Fullstack

SQL

PHP

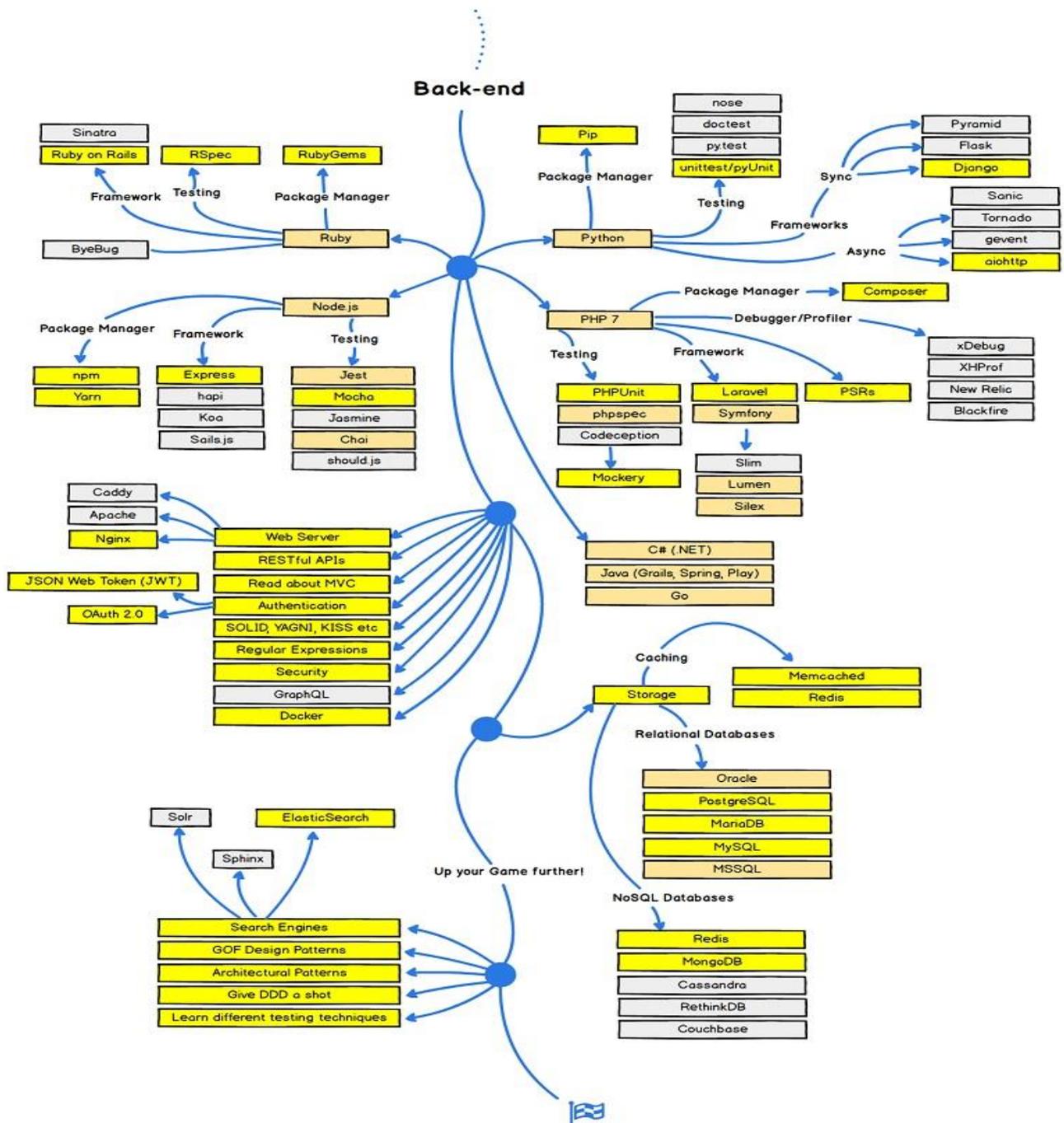
ASP

Fullstack JS

SQL

Node.js

MySQL



## INTRODUCTION TO HTML

- HTML stands for Hyper Text Markup Language
- HTML is the standard markup language for creating Web pages
- HTML describes the structure of a Web page
- HTML consists of a series of elements

- HTML elements tell the browser how to display the content
- HTML elements label pieces of content such as "this is a heading", "this is a paragraph", "this is a link", etc.

## A Simple HTML Document

### Example

```

<!DOCTYPE html>
<html>
<head>
<title>Page                               Title</title>
</head>
<body>

<h1>My                                   First           Heading</h1>
<p>My                                   first           paragraph.</p>

</body>
</html>

```

### Example Explained

- The `<!DOCTYPE html>` declaration defines that this document is an HTML5 document
- The `<html>` element is the root element of an HTML page
- The `<head>` element contains meta information about the HTML page
- The `<title>` element specifies a title for the HTML page (which is shown in the browser's title bar or in the page's tab)
- The `<body>` element defines the document's body, and is a container for all the visible contents, such as headings, paragraphs, images, hyperlinks, tables, lists, etc.
- The `<h1>` element defines a large heading
- The `<p>` element defines a paragraph

### HTML Element/Tag

An HTML element is defined by a start tag, some content, and an end tag:

```
<tagname>Content goes here...</tagname>
```

The HTML **element** is everything from the start tag to the end tag:

```
<h1>My First Heading</h1>
```

`<p>My first paragraph.</p>`

Start tag	Element content	End tag
<code>&lt;h1&gt;</code>	My First Heading	<code>&lt;/h1&gt;</code>
<code>&lt;p&gt;</code>	My first paragraph.	<code>&lt;/p&gt;</code>
<code>&lt;br&gt;</code>	<i>none</i>	<i>none</i>

**Note:** Some HTML elements have no content (like the `<br>` element). These elements are called empty elements. Empty elements do not have an end tag!

## Web Browsers

The purpose of a web browser (Chrome, Edge, Firefox, Safari) is to read HTML documents and display them correctly.

A browser does not display the HTML tags, but uses them to determine how to display the document:

## HTML Page Structure

Below is a visualization of an HTML page structure:

```
<html>
<head>
<title>Page title</title>
</head>
<body>
<h1>This is a heading</h1>
<p>This is a paragraph.</p>
<p>This is another paragraph.</p>
</body>
</html>
```

**Note:** Only the content inside the <body> section (the white area above) will be displayed in a browser.

## HTML History

Since the early days of the World Wide Web, there have been many versions of HTML:

<b>Year</b>	<b>Version</b>
1989	Tim Berners-Lee invented www
1991	Tim Berners-Lee invented HTML
1993	Dave Raggett drafted HTML+
1995	HTML Working Group defined HTML 2.0
1997	W3C Recommendation: HTML 3.2
1999	W3C Recommendation: HTML 4.01
2000	W3C Recommendation: XHTML 1.0
2008	WHATWG HTML5 First Public Draft
2012	<u>WHATWG HTML5 Living Standard</u>
2014	<u>W3C Recommendation: HTML5</u>

2016	W3C Candidate Recommendation: HTML 5.1
2017	<u>W3C Recommendation: HTML5.1 2nd Edition</u>
2017	<u>W3C Recommendation: HTML5.2</u>

## HTML Editors

### Learn HTML Using Notepad or TextEdit

Web pages can be created and modified by using professional HTML editors.

However, for learning HTML we recommend a simple text editor like Notepad (PC) or TextEdit (Mac).

We believe in that using a simple text editor is a good way to learn HTML.

Follow the steps below to create your first web page with Notepad or TextEdit.

Step 1: Open Notepad (PC)

#### **Windows 8 or later:**

Open the **Start Screen** (the window symbol at the bottom left on your screen). Type **Notepad**.

#### **Windows 7 or earlier:**

Open **Start > Programs > Accessories > Notepad**

Step 1: Open TextEdit (Mac)

Open **Finder > Applications > TextEdit**

Also change some preferences to get the application to save files correctly. In **Preferences > Format > choose "Plain Text"**

Then under "Open and Save", check the box that says "Display HTML files as HTML code instead of formatted text".

**Then open a new document to place the code.**

Step 2: Write Some HTML

Write or copy the following HTML code into Notepad:

```
<!DOCTYPE html>
```

```
<html>
```

```
<body>
```

```
<h1>My First Heading</h1>
```

```
<p>My first paragraph.</p>
```

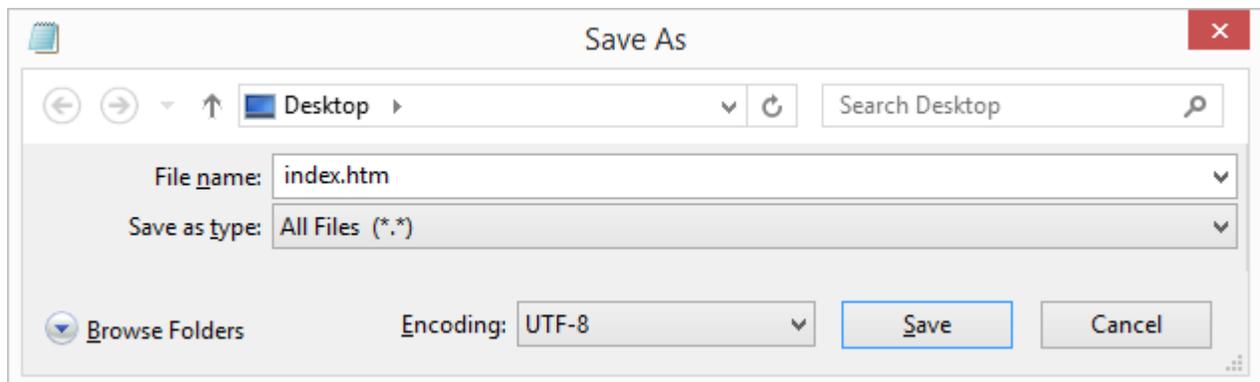
```
</body>
```

```
</html>
```

Step 3: Save the HTML Page

Save the file on your computer. Select **File > Save as** in the Notepad menu.

Name the file "**index.htm**" and set the encoding to **UTF-8** (which is the preferred encoding for HTML files).

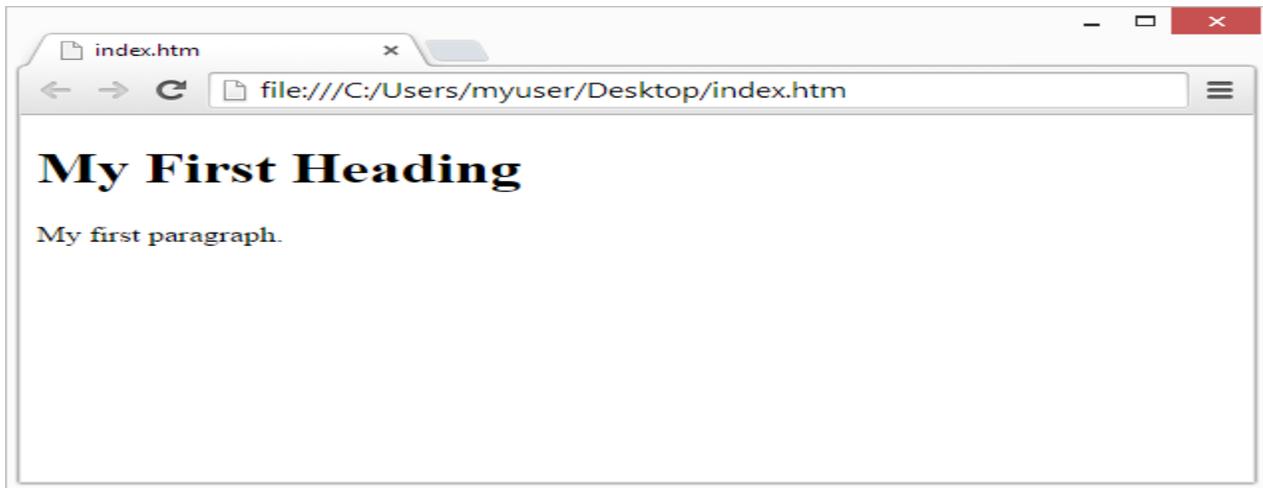


**Tip:** You can use either .htm or .html as file extension. There is no difference, it is up to you.

Step 4: View the HTML Page in Your Browser

Open the saved HTML file in your favorite browser (double click on the file, or right-click - and choose "Open with").

The result will look much like this:



```
<h1>This is a Heading</h1>
<p>This is a paragraph.</p>
</body>
</html>
```

## HTML Documents

All HTML documents must start with a document type declaration: `<!DOCTYPE html>`.

The HTML document itself begins with `<html>` and ends with `</html>`.

The visible part of the HTML document is between `<body>` and `</body>`.

### Example

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Heading</h1>
<p>My first paragraph.</p>

</body>
</html>
```

## The `<!DOCTYPE>` Declaration

The `<!DOCTYPE>` declaration represents the document type, and helps browsers to display web pages correctly.

It must only appear once, at the top of the page (before any HTML tags).

The `<!DOCTYPE>` declaration is not case sensitive.

The `<!DOCTYPE>` declaration for HTML5 is:

```
<!DOCTYPE html>
```

## HTML Headings

HTML headings are defined with the `<h1>` to `<h6>` tags.

`<h1>` defines the most important heading. `<h6>` defines the least important heading:

### Example

```
<h1>This is heading 1</h1>
```

```
<h2>This is heading 2</h2>
```

```
<h3>This is heading 3</h3>
```

## HTML Paragraphs

HTML paragraphs are defined with the `<p>` tag:

### Example

```
<p>This is a paragraph.</p>
```

```
<p>This is another paragraph.</p>
```

## HTML Links

HTML links are defined with the `<a>` tag:

### Example

```
<a href="https://www.w3schools.com">This is a link</a>
```

The link's destination is specified in the `href` attribute.

Attributes are used to provide additional information about HTML elements.

## HTML Images

HTML images are defined with the `<img>` tag.

The source file (`src`), alternative text (`alt`), `width`, and `height` are provided as attributes:

## Example

```

```

## How to View HTML Source?

Have you ever seen a Web page and wondered "Hey! How did they do that?"

## View HTML Source Code:

Right-click in an HTML page and select "View Page Source" (in Chrome) or "View Source" (in Edge), or similar in other browsers. This will open a window containing the HTML source code of the page.

## Inspect an HTML Element:

Right-click on an element (or a blank area), and choose "Inspect" or "Inspect Element" to see what elements are made up of (you will see both the HTML and the CSS). You can also edit the HTML or CSS on-the-fly in the Elements or Styles panel that opens.

## HTML Basic Examples

In this chapter we will show some basic HTML examples.

Don't worry if we use tags you have not learned about yet.

## HTML Documents

All HTML documents must start with a document type declaration: `<!DOCTYPE html>`.

The HTML document itself begins with `<html>` and ends with `</html>`.

The visible part of the HTML document is between `<body>` and `</body>`.

## Example

```
<!DOCTYPE html>
```

```
<html>
```

```
<body>
```

```
<h1>My First Heading</h1>
```

```
<p>My first paragraph.</p>
```

```
</body>
```

```
</html>
```

## The <!DOCTYPE> Declaration

The <!DOCTYPE> declaration represents the document type, and helps browsers to display web pages correctly.

It must only appear once, at the top of the page (before any HTML tags).

The <!DOCTYPE> declaration is not case sensitive.

The <!DOCTYPE> declaration for HTML5 is:

```
<!DOCTYPE html>
```

## HTML Headings

HTML headings are defined with the <h1> to <h6> tags.

<h1> defines the most important heading. <h6> defines the least important heading:

### Example

```
<h1>This is heading 1</h1>
```

```
<h2>This is heading 2</h2>
```

```
<h3>This is heading 3</h3>
```

## HTML Paragraphs

HTML paragraphs are defined with the <p> tag:

### Example

```
<p>This is a paragraph.</p>
```

```
<p>This is another paragraph.</p>
```

## HTML Links

HTML links are defined with the <a> tag:

### Example

```
<a href="https://www.w3schools.com">This is a link</a>
```

## **HTML Elements/HTML Tag**

An HTML element is defined by a start tag, some content, and an end tag:

```
<tagname>Content goes here...</tagname>
```

The HTML **element** is everything from the start tag to the end tag:

```
<h1>My First Heading</h1>
```

```
<p>My first paragraph.</p>
```

Start tag	Element content	End tag
<h1>	My First Heading	</h1>
<p>	My first paragraph.	</p>
 	<i>none</i>	<i>none</i>

**Note:** Some HTML elements have no content (like the <br> element). These elements are called empty elements. Empty elements do not have an end tag!

### Nested HTML Elements

HTML elements can be nested (this means that elements can contain other elements).

All HTML documents consist of nested HTML elements.

The following example contains four HTML elements (<html>, <body>, <h1> and <p>):

#### Example

```
<!DOCTYPE html>
```

```
<html>
```

```
<body>
```

```
<h1>My
```

First

```
Heading</h1>
```

```
<p>My
```

first

```
paragraph.</p>
```

```
</body>
```

```
</html>
```

## Example Explained

The `<html>` element is the root element and it defines the whole HTML document.

It has a start tag `<html>` and an end tag `</html>`.

Then, inside the `<html>` element there is a `<body>` element:

```
<body>
```

```
<h1>My First Heading</h1>
```

```
<p>My first paragraph.</p>
```

```
</body>
```

The `<body>` element defines the document's body.

It has a start tag `<body>` and an end tag `</body>`.

Then, inside the `<body>` element there are two other elements: `<h1>` and `<p>`:

```
<h1>My First Heading</h1>
```

```
<p>My first paragraph.</p>
```

The `<h1>` element defines a heading.

It has a start tag `<h1>` and an end tag `</h1>`:

```
<h1>My First Heading</h1>
```

The `<p>` element defines a paragraph.

It has a start tag `<p>` and an end tag `</p>`:

```
<p>My first paragraph.</p>
```

## Empty HTML Elements

HTML elements with no content are called empty elements.

The `<br>` tag defines a line break, and is an empty element without a closing tag:

### Example

```
<p>This is a <br> paragraph with a line break.</p>
```

## HTML is Not Case Sensitive

HTML tags are not case sensitive: <P> means the same as <p>.

## Anchor Tag

An anchor tag is an HTML tag. It is used to define the beginning and end of a hypertext link. Search engines use the tag to determine the subject matter of the destination URL. Users click on the anchor text to reach the link target.

### How to build a Hyperlink with an Anchor Tag in HTML

```
<a href="http://www.example.com">My sample page </a>
```

An Anchor tag is defined with *and consists of three parts*:

- the href attribute,
- the name attribute,
- and the target attribute.

### href attribute

To create a hyperlink, the destination (address) of the document must be known. A hyperlink can link to pages on your own domain, to other websites, or to a file (such as a PDF document).

For example, to link to the Google homepage, the code is as follows:

```
<a href="http://www.google.com">Google Home</a>
```

Href stands for **h**ypertext **r**eference. This attribute defines the target address of the document, which this time is linked to (http://www.google.com). The “=” sign is the connection of the attribute with the attribute value, whereby “href” is the attribute and “http://www.google.com” is the attribute value. There is an apostrophe before and after the attribute value. The defined phrase “Google Home” is known as the anchor text or link text - this is what is visible and clickable for the user. An anchor text is ideally concise, informative, and relevant to the landing page.

If you want to link internally to another part of your website, you don’t have to specify the full address, in this case the file name is sufficient:

```
<a href="MyPage.html">My page</a>
```

Using the full address could cause the page to load more slowly. See also “Site speed.”

ANCHOR TAG OnPage.org

```
<a href="http://www.example.com">My sample page</a>
```

opening anchor tag    where it links to    anchor text    close the tag

An anchor tag is an HTML tag and is used to define visible words within a text that can be clicked. These words (hyperlinks) usually refer to further information on the web. Search engines use this HTML tag in order to determine the subject matter of the linked target.

### Name attribute

The name attribute of the anchor tag can be used to enable users to “jump” to a specific point on a page (jump marker, anchor). This is especially useful with large pages or subdivisions.

The HTML code looks like this:

```
<a name="to top"></a> or  
<a name="Content"></a>Content
```

In the first code sample, you link from the bottom of a page back to the beginning, so users can quickly get to the top of the page without having to scroll for a long time. In the second example, users can directly access a part of the page, for example a subdivision point. By clicking, users are guided via name attribute directly to the subject.

```
<a href="#Content">Content</a>
```

By simply setting a hash tag (#) at the anchor name, the browser can identify a jump within the page.

You can also link to a specific location on another page internally. This would be defined as follows:

```
<a href="anotherpage.html#name">Linktext</a>
```

The “#name” is specified after the filename.

### Target attribute

The target attribute specifies how the destination page or the target document should be opened. “target=” \_ blank “ is used for opening of the target page in a new tab. This is the usual option when using target attributes for linking to other pages.

```
<a href="http://www.mypage.com" target="_blank" rel="noopener">Linktext</a>
```

### Title attribute

The title attribute gives users an important indication as to where they will be directed to when they click on a link. If the user hovers with the mouse over a link reference, the title text, which was defined in the attribute, will be displayed. This can be a tool tip, or description of the resource to which the link directs. The data from the title attribute makes the site more user-friendly.

The title attribute can also be used for images and graphic files to give a brief description of what is shown in the picture.

```
 tag is used for defining a table. The table tag contains other tags that define the structure of the table.

### Example

```
<!DOCTYPE html>
<html>

  <head>
    <title>HTML table Tag</title>
  </head>

  <body>
    <table border = "1">
      <tr>
        <th>Team</th>
        <th>Ranking</th>
      </tr>
```

```

<tr>
  <td>India</td>
  <td>1</td>
</tr>

<tr>
  <td>South Africa</td>
  <td>2</td>
</tr>

<tr>
  <td>Australia</td>
  <td>3</td>
</tr>
</table>
</body>
</html>

```

### Specific Attributes

The HTML <table> tag also supports the following additional attributes –

Attribute	Value	Description
abbr	abbreviated_text	<i>Deprecated</i> – Specifies an abbreviated version of the content in a cell.
align	right left center justify char	<i>Deprecated</i> – Visual alignment.
bgcolor	rgb(x,x,x) #hexcode colorname	<i>Deprecated</i> – Specifies the background color of the table.
border	pixels	<i>Deprecated</i> – Specifies the border width. A value of "0" means no border.

cellpadding	pixels or %	<i>Deprecated</i> – Specifies the space between the cell borders and their contents.
cellspacing	pixels or %	<i>Deprecated</i> – Specifies the space between cells.
frame	void above below hsides lhs rhs vsides box border	<i>Deprecated</i> – Used in conjunction with the border attribute, specifies which side of the frame that makes up the border surrounding the table is displayed.
rules	none groups rows cols all	<i>Deprecated</i> – Used in conjunction with the border attribute, specifies which rules appear between the cells of the table.
summary	text	<i>Deprecated</i> – Specifies the summary of the content.
width	pixels or %	<i>Deprecated</i> – Specifies the width of the table.

### Event Attributes

This tag supports all the event attributes described in – [HTML Events Reference](#)

### Browser Support

Chrome	Firefox	IE	Opera	Safari	Android
Yes	Yes	Yes	Yes	Yes	Yes

## HTML – Frames

HTML frames are used to divide your browser window into multiple sections where each section can load a separate HTML document. A collection of frames in the browser window is known as a frameset. The window is divided into frames in a similar way the tables are organized: into rows and columns.

### Disadvantages of Frames

There are few drawbacks with using frames, so it's never recommended to use frames in your webpages –

- Some smaller devices cannot cope with frames often because their screen is not big enough to be divided up.
- Sometimes your page will be displayed differently on different computers due to different screen resolution.
- The browser's *back* button might not work as the user hopes.
- There are still few browsers that do not support frame technology.

### Creating Frames

To use frames on a page we use `<frameset>` tag instead of `<body>` tag. The `<frameset>` tag defines, how to divide the window into frames. The **rows** attribute of `<frameset>` tag defines horizontal frames and **cols** attribute defines vertical frames. Each frame is indicated by `<frame>` tag and it defines which HTML document shall open into the frame.

**Note** – The `<frame>` tag deprecated in HTML5. Do not use this element.

### Example

Following is the example to create three horizontal frames –

```
<!DOCTYPE html>
<html>

  <head>
    <title>HTML Frames</title>
  </head>

  <frameset rows = "10%,80%,10%">
    <frame name = "top" src = "/html/top_frame.htm" />
    <frame name = "main" src = "/html/main_frame.htm" />
    <frame name = "bottom" src = "/html/bottom_frame.htm" />

  <noframes>
    <body>Your browser does not support frames.</body>
  </noframes>
```

```
</frameset>
</html>
```

### Example

Let's put the above example as follows, here we replaced rows attribute by cols and changed their width. This will create all the three frames vertically –

```
<!DOCTYPE html>
<html>

<head>
  <title>HTML Frames</title>
</head>

<frameset cols = "25%,50%,25%">
  <frame name = "left" src = "/html/top_frame.htm" />
  <frame name = "center" src = "/html/main_frame.htm" />
  <frame name = "right" src = "/html/bottom_frame.htm" />

  <noframes>
    <body>Your browser does not support frames.</body>
  </noframes>
</frameset>

</html>
```

### The <frameset> Tag Attributes

Following are important attributes of the <frameset> tag –

Sr.No	Attribute & Description
1	<p><b>cols</b></p> <p>Specifies how many columns are contained in the frameset and the size of each column. You can specify the width of each column in one of the four ways –</p> <p>Absolute values in pixels. For example, to create three vertical frames, use <i>cols = "100, 500, 100"</i>.</p> <p>A percentage of the browser window. For example, to create three vertical frames, use <i>cols = "10%, 80%, 10%"</i>.</p> <p>Using a wildcard symbol. For example, to create three vertical frames, use <i>cols = "10%, *, 10%"</i>. In this case wildcard takes remainder of the</p>

	<p>window.</p> <p>As relative widths of the browser window. For example, to create three vertical frames, use <code>cols = "3*, 2*, 1*"</code>. This is an alternative to percentages. You can use relative widths of the browser window. Here the window is divided into sixths: the first column takes up half of the window, the second takes one third, and the third takes one sixth.</p>
2	<p><b>rows</b></p> <p>This attribute works just like the <code>cols</code> attribute and takes the same values, but it is used to specify the rows in the frameset. For example, to create two horizontal frames, use <code>rows = "10%, 90%"</code>. You can specify the height of each row in the same way as explained above for columns.</p>
3	<p><b>border</b></p> <p>This attribute specifies the width of the border of each frame in pixels. For example, <code>border = "5"</code>. A value of zero means no border.</p>
4	<p><b>frameborder</b></p> <p>This attribute specifies whether a three-dimensional border should be displayed between frames. This attribute takes value either 1 (yes) or 0 (no). For example <code>frameborder = "0"</code> specifies no border.</p>
5	<p><b>framespacing</b></p> <p>This attribute specifies the amount of space between frames in a frameset. This can take any integer value. For example <code>framespacing = "10"</code> means there should be 10 pixels spacing between each frames.</p>

### The <frame> Tag Attributes

Following are the important attributes of <frame> tag –

Sr.No	Attribute & Description
1	<p><b>src</b></p> <p>This attribute is used to give the file name that should be loaded in the frame. Its value can be any URL. For example, <code>src = "/html/top_frame.htm"</code> will load an HTML file available in html directory.</p>

2	<p><b>name</b></p> <p>This attribute allows you to give a name to a frame. It is used to indicate which frame a document should be loaded into. This is especially important when you want to create links in one frame that load pages into an another frame, in which case the second frame needs a name to identify itself as the target of the link.</p>
3	<p><b>frameborder</b></p> <p>This attribute specifies whether or not the borders of that frame are shown; it overrides the value given in the frameborder attribute on the &lt;frameset&gt; tag if one is given, and this can take values either 1 (yes) or 0 (no).</p>
4	<p><b>marginwidth</b></p> <p>This attribute allows you to specify the width of the space between the left and right of the frame's borders and the frame's content. The value is given in pixels. For example marginwidth = "10".</p>
5	<p><b>marginheight</b></p> <p>This attribute allows you to specify the height of the space between the top and bottom of the frame's borders and its contents. The value is given in pixels. For example marginheight = "10".</p>
6	<p><b>noresize</b></p> <p>By default, you can resize any frame by clicking and dragging on the borders of a frame. The noresize attribute prevents a user from being able to resize the frame. For example noresize = "noresize".</p>
7	<p><b>scrolling</b></p> <p>This attribute controls the appearance of the scrollbars that appear on the frame. This takes values either "yes", "no" or "auto". For example scrolling = "no" means it should not have scroll bars.</p>
8	<p><b>longdesc</b></p> <p>This attribute allows you to provide a link to another page containing a long description of the contents of the frame. For example longdesc = "framedescription.htm"</p>

## HTML Forms

An HTML form is used to collect user input. The user input is most often sent to a server for processing.

### Example

First name:

Last name:

### The `<form>` Element

The HTML `<form>` element is used to create an HTML form for user input:

```
<form>
```

.

*form elements*

.

```
</form>
```

The `<form>` element is a container for different types of input elements, such as: text fields, checkboxes, radio buttons, submit buttons, etc.

All the different form elements are covered in this chapter: [HTML Form Elements](#).

### The `<input>` Element

The HTML `<input>` element is the most used form element.

An `<input>` element can be displayed in many ways, depending on the `type` attribute.

Here are some examples:

Type	Description
<code>&lt;input type="text"&gt;</code>	Displays a single-line text input field

<code>&lt;input type="radio"&gt;</code>	Displays a radio button (for selecting one of many choices)
<code>&lt;input type="checkbox"&gt;</code>	Displays a checkbox (for selecting zero or more of many choices)
<code>&lt;input type="submit"&gt;</code>	Displays a submit button (for submitting the form)
<code>&lt;input type="button"&gt;</code>	Displays a clickable button

All the different input types are covered in this chapter: [HTML Input Types](#).

## Text Fields

The `<input type="text">` defines a single-line input field for text input.

### Example

A form with input fields for text:

```
<form>
  <label for="fname">First name:</label><br>
  <input type="text" id="fname" name="fname"><br>
  <label for="lname">Last name:</label><br>
  <input type="text" id="lname" name="lname">
</form>
```

This is how the HTML code above will be displayed in a browser:

First name:

Last name:

**Note:** The form itself is not visible. Also note that the default width of an input field is 20 characters.

The `<label>` Element

Notice the use of the `<label>` element in the example above.

The `<label>` tag defines a label for many form elements.

The `<label>` element is useful for screen-reader users, because the screen-reader will read out loud the label when the user focus on the input element.

The `<label>` element also help users who have difficulty clicking on very small regions (such as radio buttons or checkboxes) - because when the user clicks the text within the `<label>` element, it toggles the radio button/checkbox.

The `for` attribute of the `<label>` tag should be equal to the `id` attribute of the `<input>` element to bind them together.

## Radio Buttons

The `<input type="radio">` defines a radio button.

Radio buttons let a user select ONE of a limited number of choices.

### Example

A form with radio buttons:

```
<form>
  <input type="radio" id="male" name="gender" value="male">
  <label for="male">Male</label><br>
  <input type="radio" id="female" name="gender" value="female">
  <label for="female">Female</label><br>
  <input type="radio" id="other" name="gender" value="other">
  <label for="other">Other</label>
</form>
```

This is how the HTML code above will be displayed in a browser:

- Male
- Female
- Other

## Checkboxes

The `<input type="checkbox">` defines a **checkbox**.

Checkboxes let a user select ZERO or MORE options of a limited number of choices.

### Example

A form with checkboxes:

```
<form>
  <input type="checkbox" id="vehicle1" name="vehicle1" value="Bike">
  <label for="vehicle1"> I have a bike</label><br>
  <input type="checkbox" id="vehicle2" name="vehicle2" value="Car">
  <label for="vehicle2"> I have a car</label><br>
  <input type="checkbox" id="vehicle3" name="vehicle3" value="Boat">
  <label for="vehicle3"> I have a boat</label>
</form>
```

This is how the HTML code above will be displayed in a browser:

- I have a bike
- I have a car
- I have a boat

## The Submit Button

The `<input type="submit">` defines a button for submitting the form data to a form-handler.

The form-handler is typically a file on the server with a script for processing input data.

The form-handler is specified in the form's `action` attribute.

### Example

A form with a submit button:

```
<form action="/action_page.php">
  <label for="fname">First name:</label><br>
  <input type="text" id="fname" name="fname" value="John"><br>
  <label for="lname">Last name:</label><br>
  <input type="text" id="lname" name="lname" value="Doe"><br><br>
```

```
<input type="submit" value="Submit">
</form>
```

This is how the HTML code above will be displayed in a browser:

First name:

Last name:

The Name Attribute for <input>

Notice that each input field must have a `name` attribute to be submitted.

If the `name` attribute is omitted, the value of the input field will not be sent at all.

#### Example

This example will not submit the value of the "First name" input field:

```
<form action="/action_page.php">
  <label for="fname">First name:</label><br>
  <input type="text" id="fname" value="John"><br><br>
  <input type="submit" value="Submit">
</form>
```

#### Advantages and disadvantages of HTML:

**HTML** is a platform-independent language so that can be used in any platform like Windows, Linux, Macintosh, etc., With the help of these **HTML** tags, we can markup the different elements of the document such as headings, paragraphs, tables, and so on.

To view this markup, you have to open the document in a browser. A browser can understand and interprets the **HTML** tags, identifies the structure of the document, and makes a decision about the presentation of the document.

#### Advantages:

- **HTML** is widely used.
- Every browser supports **HTML** Language.
- Easy to learn and use.
- Do not need to purchase any extra software because it is by default in every window.

## **Disadvantages:**

- **HTML** can create only static and plain pages so if we need dynamic pages then **HTML** is not useful.
- I need to write a lot of code for making a simple webpage.
- Security features are not good at **HTML**.

## **Separation between HTML structure and CSS style**

By clearly separating content and design, we create a document with a structure very marked logic. Everything that belongs to the content can be clearly identified as such without the need for auxiliary measures and the document, in turn, is perfectly understandable, regardless of its visual representation.

**Any Web page that you want to give a CSS design and reduce the barriers to the maximum, must contain a perfectly structured document as a base.**

By clearly separating content and design, we created a document with a very marked logical structure. Everything that pertains to the content can be clearly identified as such without the need for auxiliary measures and the document, in turn, is perfectly understandable, regardless of its visual representation.

The optical representation of the contents is regulated by centralized format instructions that are saved, intelligently, outside the document itself.

Removing obstacles to have free access to the document is relatively easy and represents a giant step in the removal of barriers.

You can add extension functions to the document (for example, with JavaScript, PHP and similar), as long as they do not hinder access to the contents.

## **Logical structure and highlighted texts**

Web pages are documents. HTML does not describe the appearance of a document or its location. HTML describes what a document is: a title, a list, an image, a table, etc. That is why HTML elements and attributes must be used correctly at the semantic level, that is, according to their meaning according to specifications.

A semantically structured HTML is the key to achieving minimum load times, independence of the platform, eliminating barriers and, not least, an impeccable design. An important example is the titles: they group parts of text and serve as orientation since they are hierarchically above the normal text. They are more important than the fluent text, so they must be declared as a title. Equally important is the hierarchy of titles. Some titles are more important than others, so they must belong to a higher level. The most important title is the first level `<h1>`, while the following levels `<h2><h3><h4>`, etc. they are his subordinates. Subtitles of equal importance should be placed on the same level.

Thus documents can be quickly read by either text browsers, screen readers or a robot. With a screen reader you can also browse titles or read them grouped by levels, for example, "all level 1 titles", "all level 2 titles", etc. In this way it is easy to get a clear and quick idea of all the contents of the text.

A correctly ranked title at the semantic level would offer this aspect:

```
<h1>A first level title</h1>
```

An incorrectly ranked title (in the semantic sense) would be, for example:

```
<div id="headline">A first level title</div>
```

Or even worse:

```
<p><font size="6"><b>A first level title</b></font></p>
```

When creating a title, what matters least, in At first, it is what font size will be used or whether it will be green or it will be bold, or exactly where it will be. The only thing that matters in the source code is that that element is a title.

Another nonsense (semantic) is to insert empty tags in the text, or any other type, simply to create a (in) certain space, for example:

```
<p>Here we have a paragraph of text</p>  
<p>&nbsp;</p>  
<p>Here we have another paragraph of text</p>
```

The same can be said for all other elements of the text, whether paragraphs, lists, citations, forms or tables. We should not waste time thinking about the font, size or color that we will give to an element, nor what distances it will keep regarding the contiguous elements. The important thing here is not the optical aspect, but the logical meaning, which should be recognizable by everyone: from a blind person who will read the page, or a theft-search engine for which the presentation does not count in the least.

## **Group the page elements**

The next thing you can do is to group different parts of the document into logical blocks (containers) that can later be sorted or formatted according to the desired visual design. The division of the Web page of our example, classic and simple, is the following:

- Header
- Main menu

- Content
- Footer

Create a container for each area and identify each container with some signal, for example, assigning it an ID. The HTML `<div>` tag here has a special meaning. This block element has virtually no properties, since it does not define any particular paragraph or table, or anything similar; it simply delimits a certain area. In the source code it would look like this:

```
<body>
<div id="header">Logo</div>
<div id="menu">Main navigation</div>
<div id="content">Titles and text</div>
<div id="footer">Copyright</div>
</body>
```

This way you have created four areas that you can access separately using CSS.

```
#header {
Property value;
}
```

```
#menu {
Property value;
}
```

```
#content {
Property value;
}
```

```
#footer {
Property value;
}
```

```
#header {
Property value;
}
```

The contents of these containers can also be made accessible and designed in relation to the context, for example:

```
#content h1 {
Property value
}
```

```
#content p {
Property value
}
```

With these last two instructions we only take titles (<h1>) and the paragraphs (<p>) that appear inside the container with ID content.

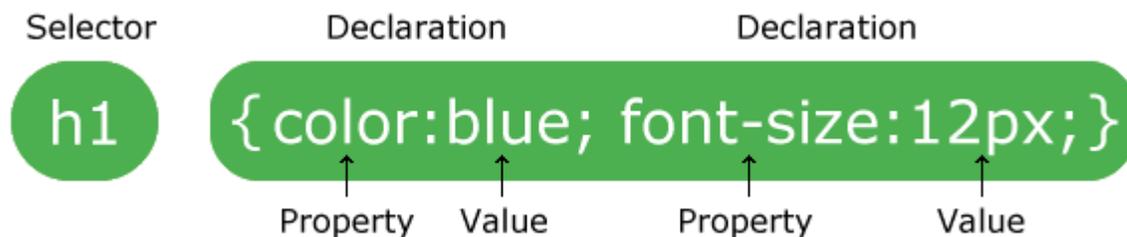
Naturally, containers can also be nested, that is, we can create containers inside containers. But we must seriously ask ourselves beforehand if you really need containers inside containers, or if the semantic structure of the content is not enough. Remember that we want to keep the source code as clear and reduced as possible. With a multiple nesting of containers <div>, for example, it is superfluous that in most cases, since we can obtain the same result by other means, for example by directly formatting the elements we want to link.

### Without barriers

Consider the Web page again from a conceptual point of view. By deciding to follow the standards, you have already taken the most important step in removing barriers, because it is implicit that you want to give full accessibility to your page. That is why it is worth taking another step and considering what else could be done to eliminate barriers. There are inveterate prejudices against the creation of web pages without barriers, but without prejudices that, when analyzed, vanish like the false beliefs that they are.

## CSS Syntax

A CSS rule-set consists of a selector and a declaration block:



The selector points to the HTML element you want to style.

The declaration block contains one or more declarations separated by semicolons.

Each declaration includes a CSS property name and a value, separated by a colon.

Multiple CSS declarations are separated with semicolons, and declaration blocks are surrounded by curly braces.

### Example

In this example all <p> elements will be center-aligned, with a red text color:

```
p {  
  color: red;  
  text-align: center;  
}
```

## Example Explained

- `p` is a **selector** in CSS (it points to the HTML element you want to style: `<p>`).
- `color` is a property, and `red` is the property value
- `text-align` is a property, and `center` is the property value

# CSS Selectors

CSS selectors are used to "find" (or select) the HTML elements you want to style.

We can divide CSS selectors into five categories:

- Simple selectors (select elements based on name, id, class)
- Combinator selectors (select elements based on a specific relationship between them)
- Pseudo-class selectors (select elements based on a certain state)
- Pseudo-elements selectors (select and style a part of an element)
- Attribute selectors (select elements based on an attribute or attribute value)

This page will explain the most basic CSS selectors.

## The CSS element Selector

The element selector selects HTML elements based on the element name.

### Example

Here, all `<p>` elements on the page will be center-aligned, with a red text color:

```
p {
  text-align: center;
  color: red;
}
```

## The CSS id Selector

The id selector uses the id attribute of an HTML element to select a specific element.

The id of an element is unique within a page, so the id selector is used to select one unique element!

To select an element with a specific id, write a hash (`#`) character, followed by the id of the element.

### Example

The CSS rule below will be applied to the HTML element with `id="para1"`:

```
#para1 {
  text-align: center;
  color: red;
}
```

**Note:** An id name cannot start with a number!

## The CSS class Selector

The class selector selects HTML elements with a specific class attribute.

To select elements with a specific class, write a period (.) character, followed by the class name.

### Example

In this example all HTML elements with class="center" will be red and center-aligned:

```
.center {
  text-align: center;
  color: red;
}
```

You can also specify that only specific HTML elements should be affected by a class.

### Example

In this example only <p> elements with class="center" will be center-aligned:

```
p.center {
  text-align: center;
  color: red;
}
```

HTML elements can also refer to more than one class.

### Example

In this example the <p> element will be styled according to class="center" and to class="large":

```
<p class="center large">This paragraph refers to two classes.</p>
```

**Note:** A class name cannot start with a number!

## The CSS Universal Selector

The universal selector (\*) selects all HTML elements on the page.

## Example

The CSS rule below will affect every HTML element on the page:

```
* {
  text-align: center;
  color: blue;
}
```

## The CSS Grouping Selector

The grouping selector selects all the HTML elements with the same style definitions.

Look at the following CSS code (the h1, h2, and p elements have the same style definitions):

```
h1 {
  text-align: center;
  color: red;
}

h2 {
  text-align: center;
  color: red;
}

p {
  text-align: center;
  color: red;
}
```

It will be better to group the selectors, to minimize the code.

To group selectors, separate each selector with a comma.

## Example

In this example we have grouped the selectors from the code above:

```
h1, h2, p {
  text-align: center;
  color: red;
}
```

## Types of CSS (Cascading Style Sheet)

Cascading Style Sheet(CSS) is used to set the style in web pages that contain HTML elements. It sets the background color, font-size, font-family, color, ... etc property of elements on a web page.

There are three types of CSS which are given below:

- Inline CSS
- Internal or Embedded CSS
- External CSS

**Inline CSS:** Inline CSS contains the CSS property in the body section attached with element is known as inline CSS. This kind of style is specified within an HTML tag using the style attribute.

**Example:**

filter\_none

edit

play\_arrow

brightness\_4

```
<!DOCTYPE html>
```

```
<html>
```

```
  <head>
```

```
    <title>Inline CSS</title>
```

```
  </head>
```

```
  <body>
```

```
    <p style = "color:#009900; font-size:50px;
```

```
      font-style:italic; text-align:center;">
```

```
      GeeksForGeeks
```

```
    </p>
```

```
  </body>
```

```
</html>
```

**Output:**

**Internal or Embedded CSS:** This can be used when a single HTML document must be styled uniquely. The CSS rule set should be within the HTML file in the head section i.e the CSS is embedded within the HTML file.

## Example

```
<!DOCTYPE html>

<html>

  <head>

    <title>Internal CSS</title>

    <style>

      .main {

        text-align:center;

      }

      .GFG {

        color:#009900;

        font-size:50px;

        font-weight:bold;

      }

      .geeks {

        font-style:bold;

        font-size:20px;

      }

    </style>

  </head>

  <body>

    <div class = "main">

      <div class ="GFG">GeeksForGeeks</div>

    </div>

  </body>

</html>
```

```
        <div class ="geeks">

            A computer science portal for geeks

        </div>

    </div>

</body>

</html>
```

### Output:

**External CSS:** External CSS contains separate CSS file which contains only style property with the help of tag attributes (For example class, id, heading, ... etc). CSS property written in a separate file with .css extension and should be linked to the HTML document using **link** tag. This means that for each element, style can be set only once and that will be applied across web pages.

**Example:** The file given below contains CSS property. This file save with .css extension. For Ex: **geeks.css**

```
body {
    background-color:powderblue;
}
.main {
    text-align:center;
}
.GFG {
    color:#009900;
    font-size:50px;
    font-weight:bold;
}
#geeks {
    font-style:bold;
    font-size:20px;
}
```

Below is the HTML file that is making use of the created external style sheet

- **link** tag is used to link the external style sheet with the html webpage.
- **href** attribute is used to specify the location of the external style sheet file.

filter\_none  
edit  
play\_arrow  
brightness\_4

```
<!DOCTYPE html>

<html>

  <head>

    <link rel="stylesheet" href="geeks.css"/>

  </head>

  <body>

    <div class = "main">

      <div class ="GFG">GeeksForGeeks</div>

      <div id ="geeks">

        A computer science portal for geeks

      </div>

    </div>

  </body>

</html>
```

### Output:

**Properties of CSS:** Inline CSS has the highest priority, then comes Internal/Embedded followed by External CSS which has the least priority. Multiple style sheets can be defined on one page. If for an HTML tag, styles are defined in multiple style sheets then the below order will be followed.

- As Inline has the highest priority, any styles that are defined in the internal and external style sheets are overridden by Inline styles.
- Internal or Embedded stands second in the priority list and overrides the styles in the external style sheet.
- External style sheets have the least priority. If there are no styles defined either in inline or internal style sheet then external style sheet rules are applied for the HTML tags.