BIM

Semester: I

FOUNDATION OF INFORMATION TECHNOLOGY

Internet and Internet Services

REFERENCE NOTE

Unit-6: Internet and Internet Services

Introduction of Internet

Internet is a network of networks. Millions of computer all over the world are connected through the internet. Computer users on the internet can contact with one another anywhere in the world. If a computer is connected to the internet, one can connect to millions of computers. It is very much similar to the telephone connection where one can talk with any person anywhere in the world.

On the internet, a huge resource of information is accessible to people across the world. Information in every field starting from education, Science, Health, Medicine, History and Geography to business, news, etc. can be retrieved from the internet. One can also download programs and software packages from the internet.

Due to the tremendous information resources the internet can provide, it is now indispensable to every organization and personal activities.

Some of the popular services of the internet are:

1. E-mail: Sending and receiving mail electronically.
2. File Transfer: Transferring files from one computer to another.
3. WWW (World Wide Web): Retrieving information residing on the internet servers in the form of websites.

4. Chat: Exchanging views or communicating information instantly.

The development of internet started when US Defense Department set up the ARPANET (Advanced Research Project Agency Network) to have a failure proof communication network for defense department of US.

This architecture was later adopted by an educational institute for an exchange of views among research scholars and then, it was thrown open to the public. Since 1994, the internet has grown by leaps and bounds driven by cheaper cost, easier to use and increase in information.

USES OF INTERNET

- **On-line communication:**

Computer users around the world use the E-mail services to communicate with each other extensively.

- **Feedback about products:**

Commercial organizations are also using the internet to gather information about the satisfaction of existing products and market opportunities of new products. This is usually accomplished by putting up an interactive survey application by the organization on a WWW site on the Internet.

- **Product promotion:**

Several commercial organizations are effectively using the internet services for promoting their products by the use of different social networks.

- **Customer Support Service:**

Many organizations are also using the internet to provide timely customer support.

- **On-line shopping:**

The Internet has also facilitated the introduction of a new market concept, which consists of virtual shops. These shops remain open 24 hrs all the year round and are accessible to make purchase all around the world.

- **On-line journals and magazines:**

There are many WWW sites on the internet, which consists of an electronic version of many journals and magazines.

- **Real-time updates:**

It helps to provide news and other happenings that may be on-going in different parts of the word but with the use of the internet, we come to know about the real-time updates in every field be it in business, sports, finance, politics, entertainment and others very easily. Many time the decisions are taken on the real-time updates that are happening in the various parts of the world and for this, the internet is very essential and helpful.

- **Research:**

In order to do research, we need to go through hundreds of books as well as the references and that was one of the most difficult jobs to do earlier. Since, the internet came into life, everything is available in just a click. The user just has to search for the

concerned topic and will get hundreds of references that may be beneficial for the research and since, the internet is here to make research activity easy and hence, public user can take a large amount benefit from the research work that have been done.

- **Education:**

Education is one of the best things that the internet can provide. There are a number of books, reference books, online help centers, expert`s views and other study oriented material on the internet that can make the learning process very easier as well as a fun to learn.

- **Financial Transaction:**

It is a term which is used when there is an exchange of money. With the use of internet in the financial transaction, the work has become a lot easier. Payments, Funds transfer, banking transactions can be done through on-line banking service.

- **Entertainment:**

The Internet is also used for entertainment. Such as chatting with friends, sharing videos, watching movies, listening music, live telecast of sports and other events, playing games, etc.

- **Job Search:**

Using internet, searching job has become an easier task. There are an endless amount of websites on the internet that provided news about a vacancy in various post as required.

Use of Internet in Job search

- **Blogging:**

There are many people who are very much interested in writing blogs and for them the internet is the best place. They can not only write blogs as per their wish but can also publicize their work so that their work reaches to most of the people and they get appreciated.

Positive impacts of Internet

The positive impacts of internet to the society, organization and individual are:

- Faster, cheaper and easier medium of communication.
- Information sharing and browsing.
- File transferring facility.
- Reach to the worldwide viewers.
- Effective, easier, faster and cheaper promotion of product or service.
- Better customer support and customer relationship management (CRM).
- Online services like banking, shopping, education, etc.

- E-mail communication for sending and receiving an electronic document.
- Enhanced collaboration between different organizations.
- Effective Supply Chain Management (SCM).
- Electronic payment system using credit /debit cards, ATM, online payment, electronic cheque, smart card, electronic purse, etc.
- Newsgroups for instant sharing of news and feedback system.
- Creation of new job opportunities related with the internet.
- Source for entertainment.
- Social networking for instant touch with friends and relatives.

Misuses of Internet / Negative impacts of Internet

The negative impacts of internet to the society, organization and individual are:

- It is the most common medium for spreading malicious software like virus, worm, etc..
- It has increased piracy.
- Pornography (uploading, publishing, viewing sexual contents in the form of text, image, audio and video).
- Stealing, modifying or destructing data.
- Piracy of software, audio, video or other intellectual contents.
- Hacking of organizational system, website, database etc.
- It is also used to harass people by sending insulting comments, making vulgar cartoons, blackmailing, etc.
- Unemployment problem for the individuals not having knowledge about the Internet.
- It has increased digital divide.

INTRODUCTION OF E-MAIL

Commonly known as email or e-mail, electronic mail is a method of exchanging digital messages from an author to one or more persons. Email operates across the Internet or other computer networks. Email is an electronic mail for sending, receiving and storing of our electronic messages. Email has gained popularity with the spread of the Internet. Today, email is the preferred method of communication.

Fig: E-mail

The email system is based on store and forward model in which email server computer system accepts, forwards, delivers and stores the messages on behalf of users to send and receive email messages. Email consists of two parts: the message header and the message body. The header contains the information like one or more sender's address, receiver's address, data, content, length, etc. whereas the body part contains the actual message which the sender has sent to the receiver.

It is one of the most frequently used features of the internet. Many people sign up for internet services so that they can send and receive e-mail messages. The internet is now the world's largest electronic mail system. More than 30 million people are directly connected to the internet and can send and receive electronic mails.

Uses of Email:

- Email enables individuals and groups to communicate with one another.
- Group of people can work on the same topic through email and generate one common document together.
- Through email, we can stay in touch with our family, relatives and friends who are away from us.
- It is the convenient way of sending job application, sending valuable documents, important images and videos.
- The use of email is essential in today's business culture for communication purpose. Businesses of all sizes, places and types can use email for multiple purposes effectively.
- It is the most efficient and certain way to communicate with management, colleagues, clients and vendors.
- Email is used when colleagues of the same or different departments need to send and receive information about projects.
- Clients and vendors use email to order products and services
- Employees can receive dates and times for meetings, conferences and mandatory training sessions via email.

ADVANTAGES OF E-MAIL

- **Fast:** It can relay our message to the recipient in a matter of minutes or seconds. Many systems also let us check to see if the receiver has seen our message or not.
- **Fun:** International electronic mail system enables us to find 'pen pals' all over the world.
- **Easy:** When we open our email box, we see a list of the message we have received. First, we read the message and then decide how to respond. We can reply to the message if we like or just delete if it requires no reply. We can save it or print it. We can even forward the message to the others.
- **Cheap:** We can send messages to others through email around the world cheaply in comparison to the charge we are paying for telephone services.

- **Flexible:** We can send a message to more than one person if we like.
- **Convenient:** Because it's written, we can compose and review our message before sending which helps in any inconvenience.
- **Word wide presence:** We can check our emails from any computer in the world while on vacation in other countries or from transportation vehicles, etc.

DISADVANTAGES OF E-MAIL

- **Threat of viruses:** Emails may carry viruses. These are small programs that harm your computer system. They can read out your email address book and send themselves to a number of people around the world.
- **Spam:** Having to deal with spam and spoofs is one of the worst avoidable time wasters online. Use some anti-spam software.
- **Misunderstandings:** Emails from people who don't take the time to read what they write before clicking 'send'. Time is wasted, either to clarify or, worse, acting on a misinterpretation of the message.
- No guarantee the mail will be read until the user logs on and checks their email.
- **Need of internet:** The recipient needs access to the Internet to receive email.

History of Internet

Growth of Internet can be discussed in three steps, as follows:

1. Internetworking Protocol - Transmission Control Protocol/Internet Protocol (TCP/IP) in 1970s
2. Usenet groups and Electronic mail in 1980s
3. World Wide Web (WWW) in 1990s

US Department of Defense Advanced Research Projects Agency (DARPA) during 1970's developed the ARPANET as a WAN to connect different computers and later to connect computers on different networks (Internetworking). Internetworking became the focus of research at ARPA and led to the emergence of Internet.

DARPA goals included:

- the ability to interconnect different types of network
- to connect through alternate paths if some path gets destroyed, and
- to support applications of various types like audio, video, text etc.

Based on the design goals, a protocol named Transmission Control Protocol/Internet Protocol (TCP/IP) was developed for computer communication. TCP/IP has become the protocol for Internet.

In late 1970s, the US National Science Foundation (NSF) designed a successor to ARPANET, called NSFNET, which was open for use to all university research groups, libraries and museums. This allowed scientists across the country to share data and

interact with each other for their research projects. Internet grew exponentially when ARPANET was interconnected with NSFNET.

In 1980s, many Internet applications like electronic mail, newsgroups, file transfer facility and remote login were developed. The Electronic mail facility allowed users to compose, send, and receive messages.

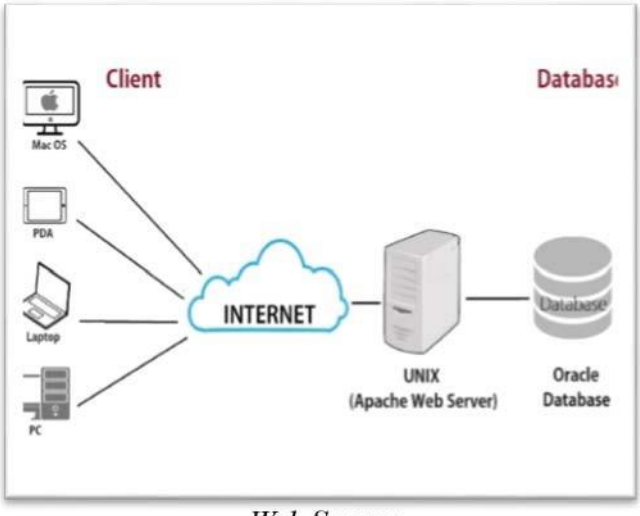
Users having common interests could exchange messages using forums like Newsgroups. The Telnet command allowed users to login to a remote computer. The File Transfer Protocol program was used to copy files from one computer to another on the Internet. In the early 1990s, a new application World Wide Web (WWW) changed the way in which Internet was used.

WWW is a system of creating, organizing, and linking documents, and was created by British scientist Tim Berners Lee. A protocol based on hypertext was developed that allowed the documents and content on WWW to be connected via hyperlink.

In 1993, Marc Andreessen at the University of Illinois developed the Mosaic browser. The WWW along with the browser made it possible to set up number of web pages that may consist of text, pictures or sound, and with link to other pages.

Web Server

Web servers are computers on the Internet that host website, serving pages to viewers upon request. A computer that delivers (serves up) web pages. Every web server has an IP address and possibly a domain name. If you enter a URL https://moecdc.gov.np/ in your web browser, the browser tries to find the IP address of the domain name from the DNS server. Once IP address is resolved then request is sent to the webserver that serves web pages of moecd.gov.np to fetch specific page “index.html”, now server will send HTML content of that specific page to the client browser. Client browser knows how to interpret HTML for end-user. Some of the popular web server applications are Apache web servers, Microsoft IIS (Internet Information Server), NGNIX, Google Web Server (GWS) etc.



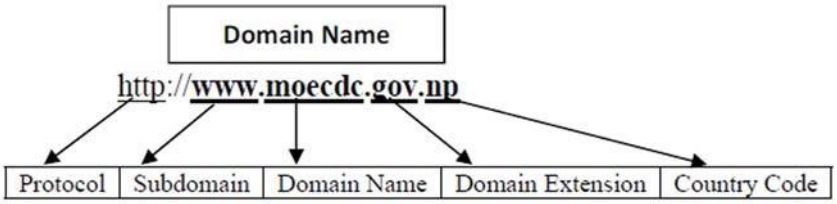
Web Server

DNS

DNS stands for Domain Name System (or service or server) and is an internet service used for converting domain name into IP address on the internet or on local networks using the TCP/IP. DNS automatically converts the website name typed in web browser address bar into the IP address of web server hosting that site. For example, the domain name https://www.moecdc.gov.np might translate to 202.45.144.44

URLs

The hypertext transfer protocol uses Internet addresses in a special format, called Uniform Resource Locator, or URL. In a URL, type specifies the type of server in which the file is located, address is the address of the server (Http, FTP), and the path is the location within the file structure of the server. The path includes the list of folders where the desired file is located. URL is the key to navigating the web. When you provide a URL for the browser, the browser finds the URL's page (index.html, index.htm, index. php) and then transfers the page to your PC.



From the above example:

http:// or https://	Hypertext Transfer Protocol / Hypertext Transfer Protocol Secure
www	Subdomain (World Wide Web)
moecdc	Domain Name (eg. Google, YouTube, Baidu, gorkhapatraonline)

.gov	Domain Extension (eg. .gov=Government, .com=Commercial, .edu=Education, .mil=Military, .net=Networ, .org=Organization)
.np	Contry Code (eg. .np=Nepal, .us=USA, .ca=Canada, .in=India, .uk= United Kingdom)

Web Browser

A Web browser is a software application such as Mozilla Firefox, Google Chrome, Microsoft Edge, Brave, Safari, Opera etc. designed to find hypertext documents on the web and then open the documents on the user's computer. It is a client application that enables the client computer to gain access to a Web server or other internet servers, such as FTP and Gopher. A browser also interprets and displays documents. Mosaic was the first web browser while Mozilla Firefox and Google Chrome are the most commonly used browsers nowadays.


Safari


Mozilla Firefox


Google chrome


Microsoft edge


Brave

Web Site

A website is a collection of related web pages. These pages contain text, graphics, audio, video and links to other pages which are typically identified with a common domain name, and published on at least one web server. Examples are moecdc.gov.np, gorkhapatraonline.com, neb.gov.np etc.

Web Pages

Hypertext documents on the Internet are known as web pages. Your web browser interprets and displays web pages. Web browsers typically can display text, various graphic and multimedia format files. Web pages are created by using a special language called Hypertext Markup Language (HTML). You can see the power of the WWW in pages that contain hypertext and hypermedia. Web pages are used to distribute news, interactive educational services, product information, catalogues, highway traffic reports, and live radio, TV and other kinds of information.

Home Page

When we load a web browser the page which loads first is called home page. Similarly, when we type a domain name in the address bar the default page that loads on the

browser are called the home page of that website. We can change the homepage of the browser by Tools Options.

Internetworking Protocol

Internetworking is the process or technique of connecting different networks by using intermediary devices such as routers or gateway devices. It ensures data communication among networks owned and operated by different entities using common data communication and the Internet Routing Protocol.

Transmission Control Protocol/Internet Protocol (TCP/IP) is the most popular internetworking protocol.

TCP/IP is the communication protocol for the Internet. The TCP/IP protocol has two parts: TCP and IP.

Transmission Control Protocol (TCP)

Transmission Control Protocol (TCP) provides reliable transport service, i.e. it ensures that messages sent from sender to receiver are properly routed and arrive intact at the destination.

TCP converts messages into a set of packets at the source, which are then reassembled back into messages at the destination. TCP operates with the packet switching technique, which is described as follows:

- The message is divided into small packets.
- Each packet contains address, sequencing information, and error control information.
- The address is used to route the packet to its destination.
- Since multiple users can send or receive information over the same communication line, the packets can arrive out of order at the destination. The sequencing information in the packet is used to reassemble the packets in order, at their destination.
- The error control information is used to check that the packet arrived at the destination is the same as that sent from the source (i.e. has not got corrupted).

Internet Protocol (IP)

- Internet Protocol (IP) allows different computers to communicate by creating a network of networks.
- IP handles the dispatch of packets over the network.
- It handles the addressing of packets, and ensures that a packet reaches its destination traveling through multiple networks with multiple standards.
- TCP/IP protocol makes it possible for any pair of computers connected to Internet to communicate, despite their hardware differences.

The Internet Architecture

Internet is a network of interconnected networks and is designed to operate without central control. If a portion of the network fails, the connection is made through alternative paths available. The architecture of Internet is hierarchical in nature. It includes client, ISP, Regional ISP and Backbone.

Client

Client (user of computer) at home or in a LAN network is at the lowest level in hierarchy.

Local ISP

- Local Internet Service Provider (ISP) is at the next higher level.
- An ISP is an organization that has its own computers connected to the Internet and provides facility to individual users to connect to Internet through their computers.
- Local ISP is the local telephone company located in the telephone switching office, where the telephone of client terminates. Examples of local ISP in Nepal are Nepal Telecom, World Link, etc.
- The client calls local ISP using a modem or Network Interface Card.

Regional ISP

- Regional ISP is next in the hierarchy. The local ISP is connected to regional ISP.
- A router is a special hardware system consisting of a processor, memory, and an I/O interface, used for the purpose of interconnecting networks. A router can interconnect networks having different technologies, different media, and physical addressing schemes or frame formats.
- The regional ISP connects the local ISP's located in various cities via routers.
- If the packet received by regional ISP is for a client connected to this regional ISP, then the packet is delivered; otherwise, packet is sent to the regional ISP's backbone.

Backbone

- Backbone is at top of the hierarchy.
- Backbone operators are large corporations like AT&T which have their own server farms connected to the backbone. There are many backbones existing in the world.
- The backbone networks are connected to Regional ISP's with a large number of routers through high speed fiber-optics.
- Network Access Point (NAP) connects different backbones, so that packets travel across different backbones.
- If a packet at the backbone is for a regional ISP connected to this backbone, the packet is sent to the closest router to be routed to local ISP and then to its destination; otherwise, packet is sent to other backbone via NAP. The packet traverses different backbones until it reaches the backbone of regional ISP for which it is destined.

Managing and Connecting to Internet

Managing the Internet

Internet is not controlled by any one person or an organization. A number of organizations manage the Internet. Some of the governing bodies of the Internet and their functions are as shown below:-

Governing Bodies of Internet	Functions
Internet Society (ISOC)	• Provides information about Internet • Responsible for development of standards and protocols related to Internet
Internet Architecture Board (IAB)	• Advisory group of ISOC • Responsible for development of Internet architecture
Internet Engineering Task Force (IETF)	• Community of network designers, operators, vendors, and researchers • Responsible for evolution of Internet • Open to all individuals
Internet Engineering Steering Group (IESG)	• Reviews standards developed by IETF
Internet Research Task Force (IRTF)	• Focuses on research towards the future of Internet (Internet protocol, architecture etc.)
Internet Assigned Number Authority (IANA)	• Allots IP address to organizations and individuals
Internet Network Information Center (InterNIC)	• Responsible for domain name registration
World Wide Web Consortium (W3C)	• Responsible for development of technologies for World Wide Web

Connecting to Internet

Requirements for connecting computer to the internet are as follows:

1. TCP/IP enabled computer
2. **Internet service provider (ISP):** an internet service provider provides you with a connection to the internet and the software you will need to navigate.
3. Telecommunication line: a telephone line is required to connect you to the internet service provider.
4. **Modem:** a modem converts a digital signal received from a computer into an analogue signal that can be sent along ordinary telephone lines, and back to digital at the other end.
5. **Web browser:** a web browser is software used to view and download Web pages and various types of files such as text, graphics and video. Examples are Microsoft Internet Explorer or Mozilla Firefox, Google Chrome.

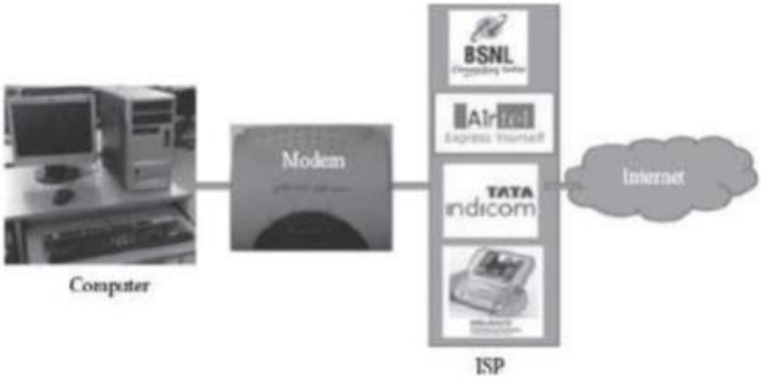


Fig: Connecting to Internet

Internet Connections

- The ISPs provide Internet connections of different types. Bandwidth and cost are the two factors that help you (the user) in deciding which Internet connection to use.
- Bandwidth is the amount of data that can be transferred through a communication medium in a fixed amount of time. The speed of Internet access depends on the bandwidth. The speed of Internet access increases with the increase in bandwidth.
- ISPs offer low speed Internet connection like Dial-up connection, and high-speed Internet connection called broadband connection. Broadband are the services with more bandwidth than standard telephone service.
- DSL, Cable modem, and Integrated Services Digital Network are some of the existing broadband connections, each, having a different bandwidth and cost.

Some of the Internet connections that are nowadays available for Internet access are:

Dial-up Access

- Dial-up access is a method of connecting to the Internet using an existing telephone line. When our computer is connected to the Internet, we cannot receive voice telephone calls on this telephone line during that time.
- In Dial-up access, we are assigned an account on the server of ISP along with some storage space on the disk of server. For example, agoel@vsnl.com is an account with an ISP named VSNL. We are also assigned a user-id and password.
- You connect to Internet by dialing-up one of the computers of ISP. For this, you use a telephone number provided by ISP and connect via a 56 Kbps modem. The computer that dials-up is the client or remote machine, and the computer of ISP is the server or host.
- The client enters the user-id and password, and gets connected to the Internet via the ISP.

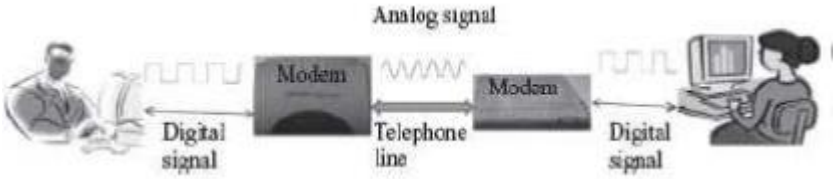


Fig: Communication via telephone line

Leased Line

- Leased line is a dedicated phone line that connects a computer (also known as gateway) to Internet, using special kind of modems. At the other end, the gateway is connected to a large number of computers, which access the Internet via the gateway.
- The gateway forms a domain on Internet, e.g. ekantipur.com, which is used to provide connection to the other computers on the Internet to connect to it.
- Leased lines provide reliable and high-speed Internet access.
- The entire bandwidth of leased line is reserved for the traffic between gateway and Internet.

- Leased lines are generally used by large organizations and universities that have their own internal network, and have large number of users.
- The leased lines are on-line, twenty-four hours a day and seven days a week. The leased lines are normally provided on a yearly contract basis. The charges for the leased line are fixed based on many criteria like the bandwidth, number of users etc. The fixed charges do not vary with the actual usage of Internet.

Integrated Services Digital Network (ISDN)

- ISDN is a digital telephone service that can transmit voice, data and control information over an existing single telephone line.
- Internet access is faster using ISDN than Dial-up access.
- ISDN is commonly used for business purposes. You are able to connect a computer, a fax machine or a telephone to a single ISDN line, and also use them simultaneously.
- ISDN is costlier than Dial-up connection. It requires a special phone service and modem.
- Nowadays, ISDN services are largely being replaced by high speed broadband connection.

Digital Subscriber Line (DSL)

- DSL is a broadband connection that allows connecting to Internet over the existing telephone lines. It does not affect your telephone voice services. DSL uses the modem provided by ISP.
- The data transmission speed of DSL ranges from 128 Kbps to 8.448 Mbps.
- Originally, telephone lines were designed for carrying human voice and the whole system worked according to this requirement. All frequencies less than 300 Hz and above 3.4kHz were attenuated, since 300Hz to 3.4kHz is the range for human speech to be clearly audible. When using DSL, a different kind of switch is used that does not filter the frequencies, thus making entire frequency available. DSL uses frequency beyond 3.4 kHz for Internet access.
- Asymmetric DSL (ADSL), a variant of DSL, provides high-speed delivery of download data (from Internet to user), than that for upload (from user to Internet), since most users download much more than they upload.
- The bandwidth of connecting wire is divided into three bands— (1) 0–25kHz for regular telephone, (2) 25kHz–200kHz for user to Internet (upload), and (3) 250kHz–1MHz for Internet to the user (download). The available bandwidth for each direction for Internet is divided into channels of 4 kHz.
- DSL is almost ten times faster than Dial-up access and is an always-on connection.

Cable Modem

- The user can connect to the Internet via a cable modem through cable television. The cable modem provides two connections—one for television and other for computer.

- The cable modem sends and receives data through the coaxial cable which connects the cable modem to the cable service provider. Coaxial cables allow transmission of Internet data, audio, and video, and control over its several channels simultaneously. The user can access the Internet and watch television at the same time.
- Like DSL, cable modem provides high-speed Internet connection. However, while using cable modem, the bandwidth is shared by many users. If many users access the Internet simultaneously then the available bandwidth for each of the user reduces.

The type of Internet connection is chosen depending upon the end user's needs and the availability of a connection. Nowadays, in cities, broadband connection is becoming more popular as it is almost ten times faster than dial-up access. For commercial purposes, leased lines and ISDN are the preferred choices. In some areas, broadband connection using a cable modem is widely used.

Internet Address

An Internet Protocol address (IP address) is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication.

A computer connected to the Internet must have a unique address in order to communicate across the Internet. Internet Protocol (IP) address is assigned uniquely to every computer connected to the Internet. IP address is provided by the ISP whose services you use to connect your computer to the Internet. IP address is a string of numbers consisting of four parts, where each part is a number between 0 and 255. An IP address looks like 201.54.122.107. Since IP addresses are numeric, it is difficult to remember everyone's IP address. So, instead of numeric IP address, domain name is used.

Domain name is a text name (string of words) corresponding to the numeric IP address of a computer on the Internet. Domain names are used for the convenience of the user. A domain name combines a group of hosts on the Internet (e.g. Facebook, Google etc.), and a top-level domain.

Some examples of top-level domain are as follows:

com—for commercial organizations,
edu—for educational institutions,
net—for gateways and administrative hosts,
org—for non-profit organizations,
co—for companies, and
ac—for academics

Some examples of domain name are google.com, wikipedia.org, tuexam.edu.np and ntc.net.np. Additionally, top-level domain is also provided based on the two-letter Internet country code. For example, np for Nepal, uk for United Kingdom, au for Australia etc.

In order to translate numeric IP address that identifies a computer on the Internet to a domain name that is convenient for the user to remember, a mapping is needed between the IP addresses and domain names. Domain Name System (DNS) server is a computer having a database that stores the IP addresses and their domain names. Whenever a user uses the domain name, DNS translates it into its corresponding IP address, to access the computer on Internet.

For example, DNS translates google.com to the IP address of the computer that houses Google.

Internet Services

Internet is a huge de-centralized network that connects computers. Every computer connected to the Internet has a unique address, which helps to identify the computer on the Internet uniquely. Over the years, Internet has grown as the biggest network for communication and provides several services to its users. Each service has its own features and uses. Some of the important services provided by Internet are: World Wide Web, electronic mail, FTP, Telnet, news, chat, discussion groups etc.

World Wide Web (WWW)

WWW is the acronym for the World Wide Web. It is also commonly known as 'The Web'. The WWW is a system that we use to access the Internet. The WWW is hypertext based information retrieval tool, it uses the hypertext to access the various forms of information available on the world's different networks.

One can easily surf the Web by jumping from one document to another using the links in those documents. These documents can be in many formats, such as text, graphics, animation, sound and latest is video. They may also be a combination of all these.

All the information on Internet are presented to the user as a document or more popularly known as Web Page. All these Web Pages are link to each other or even to section within a Web Page. And these links are known as Hyper Links.

Email

E-mail or Electronic mail is a paperless method of sending messages, notes or letters from one person to another or even many people at the same time via the Internet. E-mail is very fast compared to the normal post. E-mail messages usually take only few seconds to arrive at their destination. One can send messages any time of the day or night and it will get delivered immediately. You need not to wait for the post office to open and you don't have to get worried about holidays. It works 24 hours a day, seven days a week. What's more, the copy of the message you have sent will be available whenever you want to look at it even in the middle of the night. You have the privilege of sending something extra even such as a file, graphics, images etc. along with your e-mail. The biggest advantage to using e-mail is that it is cheap, especially when sending messages to other states or

countries and at the same time it can be delivered to a number of people around the world.

Although e-mail is faster and cheaper, it has many of the components of regular mail. It allows you to compose note, get the address of the recipient and send it. Once the mail is received and read, it can be forwarded, replied. One can even store it for later use, or delete. In e-mail even the sender can request for delivery receipt and read receipt from the recipient.

Components of an E-mail Address:

As in the case of normal mail system, e-mail is also based upon the concept of a recipient address. The email address provides all of the information required to get a message to the recipient from anywhere in the world. Consider the e-mail ID.

john@hotmail.com

In the example above, "john" is the local part, which is the name of a mailbox on the destination computer, where finally the mail will be delivered. Hotmail is the mail server where the mailbox "john" exists, .com is the type of organisation on net, which is hosting the mail server.

FTP (File Transfer Protocol)

File Transfer Protocol, is an Internet utility software used to upload and download files. It gives access to directories or folders on remote computers and allows software, data and text files to be transferred between different kinds of computers. FTP works on the basis of same principle as that of Client/Server. FTP "Client" is a program running on your computer that enables you to talk to, and get stuff from, remote computers. The FTP client takes FTP commands and sends them as requests for information from the remote computer or known as FTP servers. To access remote FTP server it is required but not necessary to have an account in the FTP server. When the FTP client gets connected, FTP server asks for the identification in-terms of User Login name and password of the FTP client. If one does not have an account in the remote FTP server, still he can connect to the server using anonymous login.

Using anonymous login anyone can login in to a FTP server and can access public file archives, anywhere in the world, without having an account. One can easily Login to the FTP site with the username *anonymous* and e-mail address as password.

The basic objectives of FTP are:

- to give flexibility and promote sharing of computer programs, files and data
- to transfer data reliably and more efficiently over network
- to encourage implicit or indirect use of remote computers using internet
- to shield a user from variations in file storage systems among hosts.

Uses of Internet

Internet is used for different purposes by different people. Some uses of the Internet are listed below:

- E-Commerce (auction, buying, selling products etc.)
- Research (on-line journals, magazines, information etc.)
- Education (e-learning courses, virtual classroom, distance learning)
- E-Governance (online filing of application (Income Tax), on-line application forms etc.)
- On-line ticket booking (airplane tickets, rail tickets, cinema hall tickets etc.)
- On-line payments (credit card payments etc.)
- Video conferencing
- Exchange of views, music, files, mails, folders, data, information etc.
- Outsourcing jobs (work flow software)
- Social networking (sites like facebook, linkedin, twitter)
- E-Telephony (sites like skype)

Internet of Things (IoT)

- Internet of Things (IoT) is the networking of physical objects that contain electronics embedded within their architecture in order to communicate and sense interactions amongst each other or with respect to the external environment.
- In the upcoming years, IoT-based technology will offer advanced levels of services and practically change the way people lead their daily lives.
- Advancements in medicine, power, gene therapies, agriculture, smart cities, and smart homes are just a very few of the categorical examples where IoT is strongly established.
- Over 9 billion 'Things' (physical objects) are currently connected to the Internet, as of now. In the near future, this number is expected to rise to a whopping 20 billion.
- There are two ways of building IoT:
    1. Form a separate internetwork including only physical objects.
    2. Make the Internet ever more expansive, but this requires hard-core technologies such as rigorous cloud computing and rapid big data storage (expensive).

Some common applications for IoT devices are:

- Smart Home (eg. smart lamps)
- Wearables (eg. smart-watches)
- Autonomous vehicles
- Smart cities
- Smart Retail

There are four main components used in IoT:

1. Low-power embedded systems: Less battery consumption, high performance are the inverse factors play a significant role during the design of electronic systems.

2. Cloud computing: Data collected through IoT devices is massive and this data has to be stored on a reliable storage server for cloud computing. The data is processed and learned, giving more room for us to discover where things like electrical faults/errors are within the system.

3. Availability of big data: We know that IoT relies heavily on sensors, especially real-time. As these electronic devices spread throughout every field, their usage is going to trigger a massive change of big data.

4. Networking connection: In order to communicate, internet connectivity is a must where each physical object is represented by an IP address.

An IoT system is comprised of four main components:

• **Sensors:** enables the devices to collect data from the environment surrounding the device (eg. velocity, GPS coordinates, temperature, etc...).

• **Connectivity:** successively the data collected is sent to the cloud (through either WiFi or Bluetooth connection).

• **Data Processing:** once the data is received by the cloud infrastructure, it can then be processed (eg. check if the data received adhere to the requirements and if it's not alert the user).

• **User Interface:** Once the data is processed, the results are then given to the end user.

Wearable Computing & Cloud Computing

Wearable Computing

• Wearable computing is a term that refers to computer-powered devices or equipment that can be worn by a user, including clothing, watches, glasses, shoes and similar items.

• Wearable computing devices can range from providing very specific, limited features like heart rate monitoring and pedometer capabilities to advanced "smart" functions and features similar to those a smartphone or smartwatch offers.

• These more advanced wearable computing devices can typically enable the wearer to take and view pictures or video, read text messages and emails, respond to voice commands, browse the web and more.

• While wearable computing devices are only just now starting to emerge from the realm of science fiction into reality, rumored devices like Google Glasses and the Apple iWatch may soon bring advanced wearable computing devices into the mainstream.

Cloud Computing

• Cloud computing basically means computing on the Internet. Connecting to the cloud represents connecting to the Internet and is made easier through the advances in wireless technology.

• In cloud services, the data center operates like the Internet and computing resources are accessed and shared as virtual resources in a secure and scalable manner.

• In a simple description, cloud computing refers to taking services ("cloud services") and moving them outside an organizations firewall on shared systems.

• In the cloud system, applications and services are accessed via the web, instead of a computer hard drive. The services are delivered and used over the Internet where a charge is paid by cloud customer typically on an "as-needed, pay-per-use" business model. The benefit is that the cloud infrastructure is managed by the cloud provider, not the individual cloud customer.

E-commerce and E-governance

E-commerce

E-commerce (Electronic Commerce) is the buying and selling of goods and services, or the transmitting of funds or data, over the internet.

E-commerce is a methodology of modern business which addresses the need of business organizations, vendors and customers to reduce cost and improve the quality of goods and services while increasing the speed of delivery.

E-commerce refers to paperless exchange of business information using EDI, E-mail, electronic fund transfer etc.

E-commerce web sites are like on-line market places where you can sell and buy items, and facilitate it by advertising your product, establishing newsgroups and blogs, posting job-oriented resumes etc.

Types of E-commerce models:

There are four main types of ecommerce models that can describe almost every transaction that takes place between consumers and businesses.

1. Business-to-Consumer (B2C)

The B2C model involves transaction between business organization and customer. The business organization sells its products directly to a consumer. Customer can view the products shown on the website. The customer can choose a product and order the same. The website will then send a notification to the business organization via email and the organization will dispatch the product/goods to the customer.

2. Business-to-Business (B2B)

The B2B model involves the transaction between companies/businesses, such as between a manufactures and a wholesaler or between wholesaler and a retailer. The business/company sells its products to an intermediate buyer who then sells the product to the final customer.

3. Consumer-to-Business (C2B)

The C2B model involves a transaction between a consumer and business organization. It is similar to B2C model, however the difference is that in this case the consumer is the seller and business organization is the buyer. In this kind of transaction, the consumer decide the price of a particular product, which business accept or decline.

4. Consumer-to-Consumer (C2C)

The C2C model involves transaction between consumers. Here, a consumer sells directly to another consumer. A well-known example is eBay.

1) Benefits of E-commerce to Organizations

1. ***International marketplace,*** what used to be a single physical marketplace located in a geographical area has now become a borderless marketplace including national and international markets? By becoming e-commerce enabled, businesses now have access to people all around the world.

2. ***Operational cost saving.*** The cost of creating, processing, distributing, storing and retrieving paper-based information has decreased.
3. ***Mass customization.*** E-commerce has revolutionized the way consumers buy well and services. In the past when Ford first started making motor cars, customers could have any color so long as it was black. Now customers can configure a car according to their specifications within minutes on-line via the ford.com website.
4. ***Enables reduced inventories*** and overheads by facilitating 'pull'-type supply chain management – this is based on collecting the customer order and then delivering through JIT (just-in-time) This is particularly beneficial for companies in the high technology sector, where stocks of components held could quickly become obsolete within months. For example, companies like Motorola (mobile phones), and Dell (computers) gather customer orders for a product, transmit them electronically to the manufacturing plant where they are manufactured according to the customer's specifications (like color and features) and then sent to the customer within a few days.
5. ***Lower telecommunications cost*.** The Internet is much cheaper than value added networks (VANs) which were based on leasing telephone lines for the sole use of the organization and its authorized partners. It is also cheaper to send a fax or e-mail via the Internet than direct dialing.
6. ***Digitization of products and processes*.** Particularly in the case of software and music/video products, this can be downloaded or e-mailed directly to customers via the Internet in digital or electronic format.
7. ***No more 24-hour-time constraints*.** Businesses can be contacted by or contact customers or suppliers at any time.

2) Benefits of E-commerce to Consumers

1. ***24/7 access*.** Enables customers to shop or conduct other transactions 24 hours a day, all year round from almost any location. For example, checking balances, making payments, obtaining travel and other information.
2. ***More choices*.** Customers not only have a whole range of products that they can choose from and customize, but also an international selection of suppliers.
3. ***Price comparisons*.** Customers can 'shop' around the world and conduct comparisons either directly by visiting different sites.
4. ***Improved delivery processes*.** This can range from the immediate delivery of digitized or electronic goods such as software or audio-visual files by downloading via the Internet, to the on-line tracking of the progress of packages being delivered by mail or courier.
5. ***An environment of competition*** where substantial discounts can be found or value added, as different retailers for customers.

3) Benefits of E-commerce to Society

1. ***Enables more flexible working practices*****,** which enhances the quality of life for a whole host of people in society, enabling them to work from It also potentially reduces environmental pollution as fewer people have to travel to work regularly.
2. ***Connects people,*** Enables people in developing countries and rural areas to enjoy and access products, services, information and other people which otherwise would not be so easily available to them.
3. ***Facilitates delivery of public services,*** For example, health services available over the Internet (on-line consultation with doctors or nurses), filing taxes over the Internet through the Inland Revenue Website.

Limitations of E-commerce

1. Limitations of E-commerce to Organizations

Lack of sufficient system security, reliability, standards and communication protocols. There are numerous reports of websites and databases being hacked into, and security holes in software. For example, Microsoft has over the years issued many security notices and 'patches' for their software. Several banking and other business websites, including Barclays Bank, Powergen and even the Consumers' Association in the UK, have experienced breaches in security where 'a technical oversight' or 'a fault in its systems' led to confidential client information becoming available to all.

Rapidly evolving and changing technology, so there is always a feeling of trying to 'catch up' and not be left behind.

Under pressure to innovate and develop business models to exploit the new opportunities which sometimes leads to strategies detrimental to the organization. The ease with which business models can be copied and emulated over the Internet increases that pressure and curtails longer-term competitive advantage.

Facing increased competition from both national and international competitors often leads to price wars and subsequent unsustainable losses for the organization.

Problems with compatibility of older and 'newer' technology. There are problems where older business systems cannot communicate with web based and Internet infrastructures, leading to some organizations running almost two independent systems where data cannot be shared. This often leads to having to invest in new systems or an infrastructure, which bridges the different In both cases this is both financially costly as well as disruptive to the efficient running of organizations.

2. Limitations of E-commerce to Consumers

Computing equipment is needed for individuals to participate in the new 'digital' economy, which means an initial capital cost to customers.

A basic technical knowledge is required of both computing equipment and navigation of the Internet and the World Wide Web.

Cost of access to the Internet, whether dial-up or broadband tariffs.

Cost of computing equipment. Not just the initial cost of buying equipment but making sure that the technology is updated regularly to be compatible with the changing requirement of the Internet, websites and applications.

Lack of security and privacy of personal data. There is no real control of data that is collected over the Web or Internet. Data protection laws are not universal and so websites hosted in different countries may or may not have laws which protect privacy of personal data.

Physical contact and relationships are replaced by electronic processes. Customers are unable to touch and feel goods being sold on-line or gauge voices and reactions of human beings.

A lack of trust because they are interacting with faceless computers.

3. Limitations of E-commerce to Society

Breakdown in human interaction. As people become more used to interacting electronically there could be erosion (divide) of personal and social skills which might eventually be detrimental to the world we live in where people are more comfortable interacting with a screen than face to face.

Social division. There is a potential danger that there will be an increase in the social divide between technical haves and have-nots – so people who do not have technical skills become unable to secure better-paid jobs and could form an underclass with potentially dangerous implications for social stability.

Reliance on telecommunications infrastructure, power and IT skills, which in developing countries nullifies the benefits when power, advanced telecommunications infrastructures and IT skills are unavailable or scarce or underdeveloped.

Wasted resources. As new technology dates quickly how you do dispose of all the old computers, keyboards, monitors, speakers and other hardware or software?

Facilitates Just-In-Time manufacturing. This could potentially cripple an economy in times of crisis as stocks are kept to a minimum and delivery patterns are based on pre-set levels of stock which last for days rather than weeks.

Difficulty in policing the Internet, which means that numerous crimes can be perpetrated and often go There is also an unpleasant rise in the availability and access of obscene material and ease with which pedophiles and others can entrap children by hidden in chat rooms.

Limitation and barriers of EC

Technological limitations

1. Need for universal standards for quality, security, and reliability
2. The telecommunications bandwidth be insufficient, especially for m-commerce, videos, and graphics
3. Software development tools are evolving.

4. It is difficult to integrate Internet and EC software with some existing (especially legacy) applications and databases.
5. Special Web servers are needed in addition to the network servers, which add to the cost of EC.
6. Internet accessibility is still expensive and/or inconvenient for many Large-scale B2C requires special automated warehouses for order fulfillment.

Non- Technological limitations

1. Security and privacy concerns deter from buying.
2. Lack of trust in sellers, in computers, and buying faceless transactions hinders buying.
3. Resistance to change
4. Many legal and public policy issues are not resolved or are not clear
5. National and international government regulations sometimes get in the way
6. Global competition intensifies
7. It is difficult to measure some of the costs and benefits of EC
8. Not enough customers. Lack of collaboration along the supply chain Management

E-governance

E-governance is the application of information and communication technology (ICT) for delivering government services, exchange of information communication transactions, integration of various stand-alone systems and services between government-to-customer (G2C), government-to-business (G2B), government-to-government (G2G) as well as back office processes and interactions within the entire government framework.

Through e-governance, government services will be made available to citizens in a convenient, efficient and transparent manner. The three main target groups that can be distinguished in governance concepts are government, citizens and businesses/interest groups. In e-governance there are no distinct boundaries.

E- governance benefits	*E- governance barriers*
- Improve delivery of services to citizens. - Improve interface with business and industries. - Empower citizen thought access to knowledge and information. - Make the working of government more efficient and effective. - More transparency. - Greater convenience. - Smoother flow of information. - More collaboration with other agencies. - Quick finalization of citizen business. - Less corruption. - Revenue growth and Cost reduction. - On-line Access to information. - Availabilities of government 24 / 7. - On-line Application submission and processing.	- Resistant to change. - Lack of public awareness. - Public fear and skepticism. - Telecommunication services. - Internet services. - IT staff and department. - Hardware and Software. - Service design. - Website design. - Lack of privacy and security.

Smart City and GIS

Smart City

A smart city is a designation given to a city that incorporates information and communication technologies (ICT) to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall costs.

The aim of a smart city is to enhance the quality of living for its citizens through smart technology.

Some major characteristics used to determine a city's smartness include: o a technology-based infrastructure;

- environmental initiatives;
- a high functioning public transportation system;
- a confident sense of urban planning and
- humans to live and work within the city and utilize its resources.

How a smart city works ?

Smart cities utilize their web of connected IoT devices and other technologies to achieve their goals of improving the quality of life and achieving economic growth. Successful smart cities follow four steps:

• Collection - Smart sensors throughout the city gather data in real time.

• Analysis - Data collected by the smart sensors is assessed in order to draw meaningful insights.

• Communication - The insights that have been found in the analysis phase are communicated with decision makers through strong communication networks.

• Action - Cities use the insights pulled from the data to create solutions, optimize operations and asset management and improve the quality of life for residents.

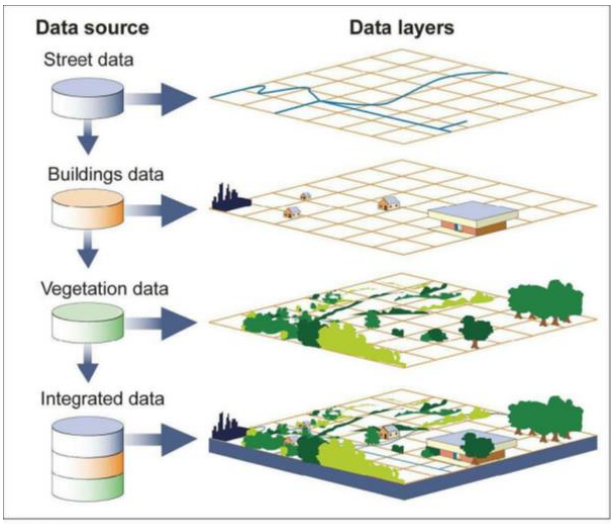
GIS

A Geographic Information System (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present geographic data.

The 4 main ideas of Geographic Information Systems (GIS) are:

- Create geographic data.
- Manage it in a database.
- Analyze and find patterns.
- Visualize it on a map

• GIS integrates many types of data. It analyzes geographic location and organizes layers of information into visualizations using maps and 3D scenes.



• Geographic Information Systems (GIS) have various industrial applications, and technological advancements have significantly enhanced GIS data, specifically how it can be used and what can be achieved as a result.

• Geographic Information Systems are powerful decision-making tools for any business or industry since it allows the analyzation of environmental, demographic, and topographic data.

• Data intelligence compiled from GIS applications help companies and various industries, and consumers, make informed decisions.

Scopes of GIS:

- Land registration system
- Utilities such as Water supply, Electricity, Telephone, Irrigation networks
- Topographical database
- Forestry planning management
- Transportation networks
- Land use and land cover planning
- Urban planning
- Natural resource planning
- Disaster management and mitigation
- Environment impact studies

DEFINITIONS of CENSORSHIP

"Supervision and control of the information and ideas that are circulated among the people within a society. In modern times, censorship refers to the examination of books, periodicals, plays, films, television and radio programs, news reports, and other communication media for the purpose of altering or suppressing parts thought to be objectionable or offensive."

Censorship is usually done to restrict or control access to certain information, ideas, or content in order to protect certain interests, values, or beliefs.

Privacy issues

Privacy issues in computing are challenges related to protecting personal and sensitive data from unauthorized access, manipulation, and misuse. These challenges span across multiple domains, from social networking to online banking.

Principally, these issues arise from:

- Unauthorized data collection and tracking
- Intrusive advertising
- Surveillance and data breaches

Some major issues concerning online privacy include:

1. Data collection and tracking by companies and third parties
2. Lack of control over personal information shared on social media platforms
3. Data breaches and cyber-attacks leading to unauthorized access to personal information
4. Privacy policies that are complex and difficult to understand
5. Invasive surveillance practices by governments and law enforcement agencies
6. Online identity theft and fraud
7. Lack of transparency in how personal data is collected and used
8. Difficulty in controlling who has access to personal information online

How to protect online privacy Threats

Although the Internet is a resource that contains multiple different types of content, there are many hackers or unauthorized users that may be harmful to you in order to thief your personal information. Below are given all of the steps that may help you to keep your personal information and computers safe while using the Internet. All of the given steps or suggestions can be beneficial for all computer users, even if what type of computer, device, or operating system they are using.

Verify data is encrypted

When you are sending any confidential information, such as debit card numbers, credit card numbers, usernames, or passwords, send these types of information securely. In Internet browsers, look for a small lock (Internet browser security lock) to verify this; an icon will be shown in the right corner of the bottom of the browser address bar or browser Window. If you see the icon, it should be in a locked condition and not in an unlocked position. Also, make sure the URL starts with https (Hypertext Transfer Protocol Secure), as displaying in the below screenshot:

Internet Explorer secure address bar.

If the lock icon is in the locked position and data is intercepted, the data is encrypted that helps to keep secure your data and prevent others to understand it. The data can be read by anyone if the lock is in the unlocked position or no lock is visible because all information will be in the form of plain text. For example, an online forum is not secure, use a password, but you will not use the password with protected sites like an online banking website.

Use a safe password

Like online bank site or other websites that contain confidential information, need to use very strong passwords, it is also recommended; you must use the different and strong password for all websites that require login id and password. You could use a password manager if you required help to remember your password.

Keep your software and operating system up-to-date

To protect yourself on the Internet, it is better to update your software installed on your computer and operating system regularly. It is necessary because many updates are released by the developers of the operating system that are related to computer security-related issues. Therefore, you should update your system when the latest updates are released.

When available always enable two-factor authentication

You can use the two-factor authentication feature to make more secure your accounts, like Gmail or others that require a login and contain your private data. It offers advanced protection by adding an additional step in verifying you at the time of login. If you enable two-factor authentication and the service does not verify your computer or other devices after authenticating your password, it sends a text message with a verification code on your cell phone. It includes more powerful security; for example, if someone knows your password of any account and tries to access your account, but he does not have your phone, he cannot access your account even with a valid password.

Always be cautious of e-mail links and attachments

The email attachments and hyperlinks sent through email are the most common resources to spread viruses and malware. It is recommended to always be extremely cautious to open any attachments and hyperlinks, which you have received through email from others, even if they have sent by friend or family.

Be aware of phishing scams

There are many phishing scams and techniques that can be more harmful in respect to losing your secret information. Therefore, it is necessary to familiarize yourself with these types of techniques. Hackers mainly target websites that need a login, such as PayPal, eBay, Amazon, online banking sites, and other popular sites.

E-mail is not encrypted

If you send any confidential information through email, it can be read or understood by unauthorized users as email is not encrypted. Therefore, confidential data like debit card information, credit card information, password and more should not be transmitted over e-mail.

Use an alternative browser

For protecting your systems, Internet browsers also play an important role. For example, earlier versions of Internet Explorer are not more secure. If you are using a lass secure browser in terms of your browser like Internet Explorer, you should switch to another

browser like *Mozilla Firefox* or *Google Chrome*. Also, if you are using Microsoft Windows 10 operating system on your computer and want to stay to use a Microsoft Internet browser, you can switch to the Microsoft Edge rather than Internet Explorer that is more secure in terms of protecting your systems.

Some basic terms

Internet

The Internet is an interconnected network of thousands of networks and millions of computers linking business, education institutions, government agencies, and individuals together.

Used / application of internet

1. Search information
2. E-mail service
3. Communication
4. File Transfer
5. Remote login
6. Publishing of articles, reports, and newsletter.
7. Online education
8. Online shopping.
9. Entertainment.

Intranet:

An intranet is a private network that uses internet protocols, to securely share part of an organization's information between its employees. An intranet is a Local Area Network or Wide Area Network that uses TCP/IP protocol but, belongs to a corporation, school, or organization.

The intranet is accessible only to the organization's workers. If the intranet is connected the Internet, then it is secured by a firewall to prevent unauthorized users from gaining access to it.

Advantages of an Intranet

1. **Workforce productivity:** Employees can easily access and share information in-between their workgroups which enhances productivity
2. **Time:** With intranets, organizations can make more information available to employees in any time.
3. **Communication:** Intranets can serve as powerful tools for communication within an organization.

Extranet:

An extranet is a private intranet that can be accessed by outside users over the secure channel. To gain entrance to the extranet's resource, an external user must log on to the networks by providing a valid user ID and password. The extranet is a combination of the public Internet and the closed intranet.

Difference between Internet and Intranet?

S.N.	Intranet	S.N.	Internet
1	It is a private network.	1	It is a public network.
2	Intranet users are your own employees who know a lot about the company, its organizational structure and special terminology.	2	Internet user know much less about your company and also care less about it.
3	The intranet is used for everyday work inside the company.	3	The Internet is mainly used to find out information.
4	The intranet will have many official draft reports, project progress reports, human resource information, and other detailed information.	4	Internet have all types of information based on requirements.
5	Intranet has less amount of information.	5	Internet has tremendous amount of information.
6	Intranet can work on low and mid-bandwidth.	6	Internet requires higher band width.