

NB:

COPY ALL THE NOTES AND ANSWER THE QUESTIONS

NETWORKING CONNECTING DEVICES

Networking devices are used to connect computers and peripheral devices so they can communicate. For example Hubs, switches, routers, and access points are all used to connect computers together on a network, but each of them has different capabilities.

Multiplexer

A multiplexer is an electronic device that selects from several input signals and transmits one or more output signals.

One example of an analog multiplexer is the source control on a home stereo unit that allows the user to choose between the audio from a compact disc (CD) player, digital versatile disc (DVD) player and cable television line.

Network Interface Card



Network Interface Card (NIC)

The **Network Interface Card** (NIC) has interfaces for twisted pair, thicknet and thinnet connectors.

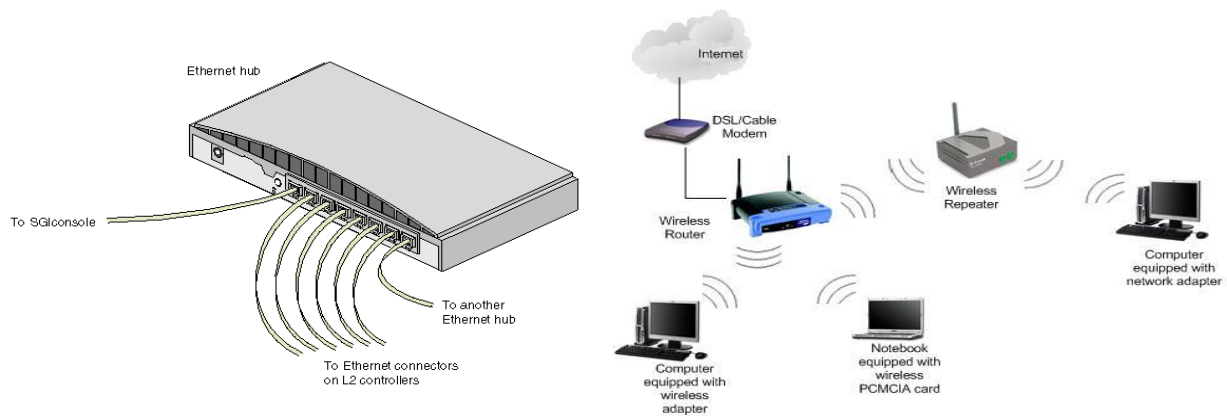
A *NIC* is an *expansion board* you insert into a computer so the computer can be connected to a network. Most NICs are designed for a particular type of network, protocol, and media, although some can serve multiple networks.

In computer networking, a **NIC** provides the hardware interface between a computer and a network. A NIC technically is network adapter hardware in the form factor of an add-in card such as a PCI or PCMCIA card.

Some NIC cards work with wired connections while others are wireless. Most NICs support either wired Ethernet or Wi-Fi wireless standards. Ethernet NICs plug into the system bus of the PC and include jacks for network cables, while Wi-Fi NICs contain built-in transmitters / receivers (transceivers).

In new computers, many NICs are now pre-installed by the manufacturer. All NICs feature a speed rating such as 11 Mbps, 54 Mbps or 100 Mbps that suggest the general performance of the unit.

NICs are designed for Ethernet LANs, Token Ring, Fiber Distribute Data Interface (FDDI), and so on. An Ethernet NIC will not work with Token Ring and vice versa.



Repeater

Wireless repeater is a device usually used to extend wireless coverage in wireless network by repeating the wireless signal generated by wireless router/access point. Some better repeaters also able to improve wireless transmission rate. This device is referred to as **wireless range extender, booster or expander** by some vendors.

Network **repeaters** regenerate incoming electrical, wireless or optical signals. With physical media like Ethernet or Wi-Fi, data transmissions can only span a limited distance before the quality of the signal degrades. Repeaters attempt to preserve signal integrity and extend the distance over which data can safely travel.

Actual network devices that serve as repeaters are referred to **Active hubs**. Active hubs are sometimes also called "multiport repeaters," but more commonly they are just "hubs." Other types of "passive hubs" are not repeaters. In Wi-Fi, access points function as repeaters only when operating in so-called "repeater mode."

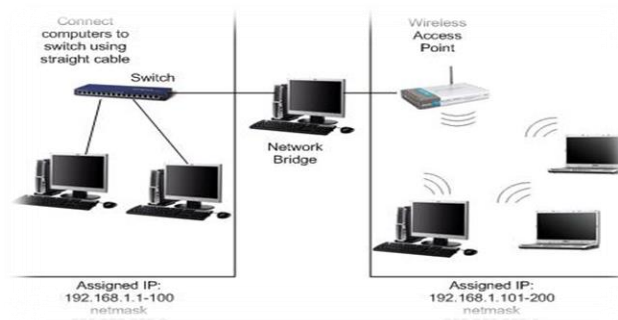
Hub

Hubs enable computers on a network to communicate. Each computer plugs into the hub with an Ethernet cable, and information sent from one computer to another passes through the hub. A hub can't identify the source or intended destination of the information it receives, so it sends the information to all of the computers connected to it, including the one that sent it.

Hubs regenerate and retime network signals. Hubs propagate signals through the network and they cannot filter network traffic. They cannot determine best path. They are used as network concentration points. They are really multiport repeaters.

A hub can send or receive information, but it can't do both at the same time. This makes hubs slower than switches. Hubs are the least complex and the least expensive of these devices.

Network Bridge



Bridge connects multiple network segments at the data link layer of the OSI model. A bridge reads the outermost section of data on the data packet, to tell where the message is going. It reduces the traffic on other network segments, since it does not send all packets. Bridges can be programmed to reject

packets from particular networks. Bridging occurs at the data link layer of the OSI model, which means the bridge cannot read IP addresses, but only the outermost hardware address of the packet. In our case the bridge can read the Ethernet data which gives the hardware address of the destination address, not the IP address. Bridges forward all broadcast messages. Only a special bridge called a translation bridge will allow two networks of different architectures to be connected. Bridges do not normally allow connection of networks with different architectures. The hardware address is also called the MAC (media access control) address. To determine the network segment a MAC address belongs to, bridges use one of:

- **Transparent Bridging** - They build a table of addresses (bridging table) as they receive packets. If the address is not in the bridging table, the packet is forwarded to all segments other than the one it came from. This type of bridge is used on Ethernet networks.
- **Source route bridging** - The source computer provides path information inside the packet. This is used on Token Ring networks.

Network Router

A router is used to route data packets between two networks. It reads the information in each packet to tell where it is going. If it is destined for an immediate network it has access to, it will strip the outer packet, readdress the packet to the proper Ethernet address, and transmit it on that network. If it is destined for another network and must be sent to another router, it will re-package the outer packet to be received by the next router and send it to the next router. Routing occurs at the network layer of the OSI model. They can connect networks with different architectures such as Token Ring and Ethernet. Although they can transform information at the data link level, routers cannot transform information from one data format such as TCP/IP to another such as IPX/SPX. Routers do not send broadcast packets or corrupted packets. If the routing table does not indicate the proper address of a packet, the packet is discarded.

Gateway

A gateway can translate information between different network data formats or network architectures. It can translate TCP/IP to AppleTalk so computers supporting TCP/IP can communicate with Apple brand computers. Most gateways operate at the application layer, but can operate at the network or session layer of the OSI model. Gateways will start at the lower level and strip information until it gets to the required level and repackage the information and work its way back toward the hardware layer of the OSI model. To confuse issues, when talking about a router that is used to interface to another network, the word gateway is often used. This does not mean the routing machine is a gateway as defined here, although it could be.

Firewall

By function capability is expanded gateway. Expansion refers primarily to prevent unauthorized access to the network in general. The above means that this device provides control network traffic between boarding school and local area networks in a way that all incoming Internet traffic to the firewall rules defined filters and ducts in the local network and vice versa. Since this is the internal supply unit operates on the same level of the OSI model as a gateway. In addition to traffic filtering to define access rules (ACL - Access Control Lists), the most important is the ability to define the IP address of the local network as a private network, and mechanism of NAT (Network Address Translation) to translate incoming IP address in the local private IP addresses and vice versa.

Switch

Switches are sometimes called multiport bridges. A typical *bridge may have just two ports, linking two segments of the same network*. A switch has several ports, depending on how many network segments are to be linked. A switch is a more sophisticated device than a bridge. A switch maintains a table of the MAC addresses for computers that are connected to each port. When a frame arrives at a port, the switch compares the address information in the frame to its MAC address table. The switch then determines which port to use to forward the frame.



Switch



Access points

Access points (also called base stations) provide wireless access to a wired Ethernet network. An access point plugs into a hub, switch, or wired router and sends out wireless signals. This enables computers and devices to connect to a wired network wirelessly. Access points act a lot like cellular phone towers: you can move from one location to another and continue to have wireless access to a network. When you connect to the Internet wirelessly using a public wireless network in an airport, coffee shop, or hotel, you are usually connecting through an access point.

MODEM

Modem is basically described a device that are used at home for connection to Internet Service Providers (Orange, Air Tel, Iskon, Globalnet and others). But there are other kinds of devices to connect to a local area network to an ISP (Internet Service Provider). So that we can implement DSL - ADSL, ISDN device, cable modem and other devices with some additional devices allow the user PC or over a local network to communicate with the Internet. Basically this or a similar symbol is used wherever connects the user or the LAN to an ISP.

Revision Questions and Answer

1. (a) Briefly, write short notes on the following networking devices:

Modem

It is a device used to connect a computer to a telephone line. It changes the digital signals to analog form and then analog and back to digital. Therefore it does the modulation and demodulation of signals.

Hub

It is a component that connects computers on a network and is able to relay signals from one computer to another on the same network.

Router

Routers are the traffic directors of the global internet. All routers maintain complex routing tables which allow them to determine appropriate paths for packets destined for any address. Routers communicate with each other, and forward network packets out of or into a network.

Repeater

A repeater electrically amplifies the signal it receives and rebroadcasts it. Repeaters can be separate devices or they can be included into a concentrator. They are used when the total length of your network cable exceeds the standards set for the type of cable being used.

Bridge

A bridge is a device that allows you to segment a large network into two smaller, more efficient networks. It performs the following functions:

- *If you are adding to an older wiring scheme and want the new network to be up-to-date, a bridge can connect the two.*
- *The bridge manages the traffic to maintain optimum performance on both sides of the network.*
- *You might say that the bridge is like a traffic cop at a busy intersection during rush hour.*
- *It keeps information flowing on both sides of the network, but it does not allow unnecessary traffic through.*
- *Bridges can be used to connect different types of cabling, or physical topologies. They must, however, be used between networks with the same protocol*

Gateway

It is a device that can be configured to provide access to wide area network or internet.

(b) State the difference between a hub and a switch in relation to computer networking.

Hub is a component that connects computers on a network and is able to relay signals from one computer to another on the same network,

While;

A **Switch** is a component that forwards a packet of data directly to the address mode without broadcasting. It transmits the packet using a point – to – point transmission.

(c) (i). Outline three functions of networking operating system.

- It makes sharing of resources possible.
- It transmits data around the network.
- It responds to requests from application programs running on the networks.
- It enables nodes on the network to communicate with each other more efficiently.
- It implements network security.
- It supports other services across the network.

(ii). State two examples of network operating system.

- | | |
|-------------------|------------------|
| • Windows NT. | • Unix. |
| • Windows 2000. | • Linux. |
| • Windows XP. | • Novel netware. |
| • Windows Server. | |

CHAPTER 16: THE INTERNET AND WWW

16.1 Definition

The **Internet** is a global system of interconnected computer networks that use the standard Internet protocol suite (*TCP/IP*) to serve billions of users worldwide.

An Internet can be defined as a network connecting an affiliated set of clients using standard Internet protocols, especially TCP / IP and HTTP or as an IP – based network of nodes behind a firewall, or behind several firewalls connected by secure, possibly virtual, networks.

It is a *network of networks* that consists of millions of private, public, academic, business, and government networks, of local to global scope, that are linked by a broad array of electronic, wireless and optical networking technologies.

The Internet is a *worldwide public network of networks that interconnect thousands* of smaller networks to form one large “web” of communication.

It is made up of thousands of smaller, national, regional, governmental, academic and commercial networks. It is a global network. Information can be communicated from one city (or country) to another through Internet.

In general, a web is an unstructured client / server network that uses HTTP as its transaction protocol. The World Wide Web comprises all HTTP nodes on the public Internet.

You can access information all over the world. More than two billion people around the world use the Internet daily for different purposes. For example, to communicate with other people around the world, access information and latest news around the world etc. The computers are the main components through which information can be electronically sent and received from one location to another. For this purpose, a special device called modem is also used with computer and then computer is attached with the telephone line. The modem sends and receives the information over telephone lines. You must have an Internet connection of any local ISP (Internet Service Provider) to share the information on Internet. The telephone lines, fiber-optic cables, satellite communications are the main media of communications that are used to connect to the Internet.

Today Internet is a global web of nearly one million computer networks. Internet host computers are connected to the Internet round the clock.

16.1.1 HISTORY OF THE INTERNET

The Internet was started in 1969 by the defense department of USA. Later, it was handed over to the Defense Advanced Research Projects Agency (DARPA). The DARPA launched the first Internet program. The DARPA established a network of 4 computers and named as ARPANet. The protocols (Software) that define the rules to exchange information between computers were created by DARPA.

The idea of computer networking soon became popular. Several universities and research organizations developed their own computer networks. They joined their networks to ARPANet. The ARPANet became the network of networks. This network of computer networks was named as Internet.

Some organizations connected entire networks to ARPANET to take advantage of its high-speed communications. In 1986, the National Science Foundation (NSF), another federal agency of USA connected its huge network of five super computer centers, called NSFnet established for academic purpose and was accessible to everyone. Later, it was expanded all over the country and large number of universities and research centers were connected to this network. This configuration of complex networks and hosts became known as the Internet.

The academic networks were established and all these were interconnected together to share the information. The way of connecting one network to another is termed as internetworking and “Internet” is also derived from internetworking. The NSF provided the connections for academic research centers only.

After this many telecommunication companies established their own network backbones by using the same networking protocol as NSFNet used and also provided connections to private users. In 1995, NSF terminated its network on the Internet.

Today, the Internet consists of many local, regional, national and international networks.

16.1.1 How the Internet is controlled

There are three main organizations that are supposed to guide and coordinate the working of Internet, these include:

Internet Engineering Task Force (IETF)

It develops and maintains the Internet’s communication protocols which are the methods by which computers on the Internet are connected.

Internet Research Task Force (IRTF)

It looks into long term research problems many of which are at times critical to the Internet.

Internet Architecture Board (IAB)

This oversees the IETF and IRTF. It also ratifies any major changes to the Internet that comes from the IETF.

16.1.2 Network Backbone

The inner structure of the Internet works much like a transportation system. The main communication lines carry the heaviest amount of traffic on the Internet. These communication lines are referred to as Internet backbone. It can also be defined as:

The **central structure** or element of the network, which connects other elements of the network and handles the major traffic, is called the backbone. The backbone is a high-speed element. It is the major communication link that ties Internet servers across wide geographical areas.

16.2 CONNECTING TO THE INTERNET

Many home and small business users connect to the Internet via high-speed broadband Internet service. With broadband Internet service, your computer or mobile device usually is connected to the Internet the entire time it is powered on.

Examples of broadband Internet service include *cable*, *DSL*, *fiber*, *radio signals*, and *satellite*.

- Cable Internet service provides high-speed Internet access through the cable television network via a cable modem.
- DSL (digital subscriber line) provides high-speed Internet connections using regular copper telephone lines.
- Fiber to the Premises (FTTP) uses fiber-optic cable to provide high-speed Internet access to home and business users.
- Fixed wireless provides high-speed Internet connections using a dish-shaped antenna on your house or business to communicate with a tower location via radio signals.
- A cellular radio network offers high-speed Internet connections to devices with built-in compatible technology or computers with wireless modems.
- A Wi-Fi (wireless fidelity) network uses radio signals to provide high-speed Internet connections to compatible or properly equipped wireless computers and devices.
- Satellite Internet service provides high-speed Internet connections via satellite to a satellite dish that communicates with a satellite modem.

16.2.1 Factors considered for Connecting to the Internet

To connect to the Internet you must have:

a) **Internet account of any ISP** (Internet Service Provider) company to connect to Internet.

In Uganda there are many ISP companies and some of these companies include:

- MTN (Uganda) – Mobile Telephone Network
- UTL - Uganda Telecom Limited
- Infocom Uganda Ltd
- Airtel Uganda Ltd
- Roke Telecom
- Orange Uganda, etc.

Most Internet Service Providers have their Internet cards available in your local shops having varied amount.

b) Hardware

- A computer, which has appropriate hardware like Hard disk to hold the software such as Microsoft Windows 9x, Microsoft Windows XP, Microsoft Windows Vista, Microsoft Windows 7, Macintosh or any other UNIX operating system.
- A telephone line to connect to the ISP server.
- A modem to exchange information between user's computer and server of ISP through telephone line
- Communication media such as VSAT, wireless antenna or telephone line.
- Network Interface Card (NIC) that enables the computer to connect and be able to communicate.
- Other devices include; routers, radio receivers, etc.

c) Software

To connect to the Internet, a computer requires mainly three different kinds of

software:

- **TCP/IP:**

TCP/IP, or Transmission Control Protocol / Internet Protocol, is the basic communication protocol of the Internet. It allows programs on user's computer to communicate properly over the internet. Usually, when you are set up with direct access to the Internet, your computer is provided with a copy of the TCP/IP program. Similarly, every other computer that you may send messages to or get information from also has a copy of TCP/IP.

- **Dialer Software:**

This is software provided by the ISP to instruct the modem to dial the phone number, and identify the user's machine to the access provider's system for access to the network.

- **Browser:**

To use the Internet, a web browser is essential. This program allows the user to view the information available on the World Wide Web. Examples include – Internet Explorer, Mozilla Firefox, Netscape navigator, etc.

16.2.2 How the Internet works

It must be noted that there is no particular organization that controls the Internet. Different networks of private companies, government agencies, research organizations, universities etc. are interconnected together. You can say that the Internet is a huge collection of millions of computers, all linked together on a computer network.

The network allows all of the computers to communicate with one another. A home computer may be linked to the Internet using a phone-line modem, DSL or cable modem that communicates to an Internet Service Provider (ISP).

A computer in a business or university will usually have a network interface card (NIC) that directly connects it to a Local Area Network (LAN) inside the business. The business can then connect its LAN to an ISP using a high-speed phone line such as Ti Line. A Ti Line can handle approximately 1.5 million bits per second, while a normal phone line using a modem can typically handle 30,000 to 50,000 bits per second.

16.2.4 Internet Service Provider (ISP)

ISP is a company that provides the Internet connections to the users. There are many ISP companies in each big city of each country of the world. You have to get an Internet connection from any ISP company of your local city to connect to the Internet.

ISPs then connect to larger ISPs, and the largest ISPs maintain fiber-optic "backbones" for an entire region. Backbones around the world are connected through fiber-optic lines, under Sea cables or satellite links. In this way, every computer on the Internet is connected to every -other computer on the Internet.

16.2.5 Types of ISPs

- **Hosting ISPs**

Hosting ISPs routinely provide email, FTP, and web-hosting services.

- **Transit ISPs**

Just as their customers pay them for Internet access, ISPs themselves pay upstream ISPs for Internet access. An upstream ISP usually has a larger network than the contracting ISP and/or is able to provide the contracting ISP with access to parts of the Internet the contracting ISP by itself has no access to

- **Virtual ISPs**

A Virtual ISP (VISP) is an operation which purchases services from another ISP (sometimes called a "wholesale ISP" in this context) which allows the VISP's customers to access the Internet using services and infrastructure owned and operated by the wholesale ISP.

- **Free ISPs**

Free ISPs are Internet Service Providers (ISPs) which provide service free of charge.

16.2.6 Types of ISP Connection

There are many ways to connect to an Internet service provider (ISP). Some ISPs include a local telephone company or a local cable company. There are three main considerations for an Internet connection which include speed, reliability, and availability.

POTS - A plain old telephone system (POTS) connection is extremely slow but it is available wherever there is a telephone. The modem uses the telephone line to transmit and receive data.

ISDN - The Integrated Services Digital Network (ISDN) offers faster connection times and has faster speeds than dial-up, and allows multiple devices to share a single telephone line. ISDN is very reliable because it uses POTS lines. ISDN is available in most places where the telephone company supports digital signaling.

DSL- Digital Subscriber Line (DSL), like ISDN, allows multiple devices to share a single telephone line. DSL speeds are generally higher than ISDN. DSL allows the use of high-bandwidth applications or multiple users to share the same connection to the Internet. In most cases, the copper wires already in your home or business are capable of carrying the signals needed for DSL communication. There are limitations to DSL technology. DSL service is not available everywhere, and it works better and faster the closer the installation is to the telephone provider's central office (CO). Also, DSL is much faster when receiving data over the Internet than it is when sending it. In some cases, the lines that are in place to carry telephone signals do not technically qualify to carry DSL signals.

Asymmetric Digital Subscriber line (ADSL)

ADSL is a technology that provides high speed transmission using the standard telephone network in digital form with ADSL adaptor at either end, but splitting the frequencies on the telephone line into three channels of different bandwidth (asymmetric).

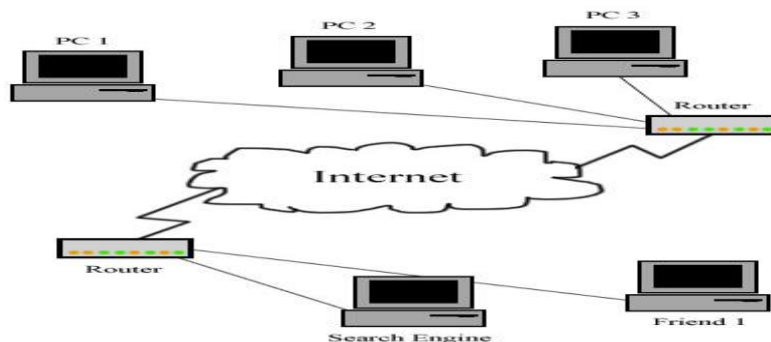
The bandwidth for each channel is set according to how much data will be transmitted through it

Cable - Cable Internet connection does not use telephone lines. Cable uses coaxial cable lines originally designed to carry cable television. Like DSL, cable offers high speeds and an "always-on" connection, which means that even when the connection is not in use, the connection to the Internet is still available. Many cable companies offer telephone service as well. Because cable television reaches many homes, it is an alternative for people unable to receive DSL service. Theoretically, the bandwidth of cable is higher than DSL, but can be affected by limitations of the cable provider. Most homes that have cable television have the option to install high-speed Internet service.

Satellite – For people that live in rural areas, broadband satellite Internet connections provide a high-speed connection that is always on. A satellite dish is used to transmit and receive signals to and from a satellite that relays these signals back to a service provider. The cost of installation and the monthly service fees are much higher than those for DSL and cable subscribers. Heavy storm conditions can degrade the quality of the connection between the user and the satellite, or the satellite to the provider, slowing down or even disconnecting the connection. In most cases, the service provider will provide a dial-up connection as a backup.

Wireless – Many types of wireless Internet services are available. The same companies that offer cellular service may offer Internet service. PCMCIA and PCI cards are used to connect a computer to the Internet. The service is not available in all areas. Cellular Internet allows you to remain connected to the Internet anywhere there is a signal. Service providers may offer wireless Internet service using

microwave technology in limited areas. Signals are transmitted directly to an antenna on the roof of the house or building.



The Factors to consider when choosing an ISP

- Setup costs
- Experience for both ISP and client.
- Auxiliary/additional services offered by the ISP e.g. E – Mail/telephone SMS facility.
- Availability of online help.
- Compatibility of ISP software with yours e.g. Windows and Linux.
- Efficiency/Effectiveness of ISP devices e.g. speeds of ISP modem, Bandwidth etc. cabling architecture, Bit–Bus architecture for devices etc.
- Available technology. For example, In case you intend to hire a dial-up service, you need to consider the availability of a local phone number or toll-free number for access.
- You also need to consider the Technology offered by the ISP.
- Technical support. What kinds of support services can the ISP provides.
- The size of the ISP’s Client base. ISP capacity is usually limited, the bigger the client base the less reliable is the ISP.
- Coverage. Does the ISP coverage reach your location or not?

The services offered by the ISP

The services an ISP can provide include:

- Internet access- internet connectivity.
- Internet transit- connecting smaller ISP networks to the Internet
- Domain name registration
- Web hosting
- Hiring storage space to small organisations
- Electronic mail services

16.2.7 Advantages and Disadvantages of using the Internet

Advantages of using the internet

- It allows access to a wealth of information, such as news, weather reports, and airline schedules.
- It enables one to download files, listen to music, and watch movies free of charge.
- Access sources of entertainment and leisure, such as online games, magazines, and vacation planning guides.
- It has powerful search engines that enable users locate specific data in a short time.
- It provides the ability for a user to do research from your home versus research libraries.
- It provides message boards where people can discuss ideas on any topic. Ability to get wide range of opinions.
- The internet provides the ability of e-mails. Free mail service to anyone in the country. Therefore, communication is made simple and cheaper for a user.
- Friendships and love connections have been made over the internet by people involved in love/passion over similar interests.

- It enables one to shop for goods and services online i.e. e-commerce. One can buy a car from Japan without necessarily travelling.

Disadvantages of using the internet

- There is a lot of wrong information on the internet. Anyone can post anything, and much of it is garbage.
- There are predators that hang out on the internet waiting to get unsuspecting people in dangerous situations.
- Some people are getting addicted to the internet and thus causing problems with their interactions of friends and loved ones.
- Pornography that can get in the hands of young children too easily.
- Easy to waste a lot of time on the internet. You can start surfing, and then realize far more time has passed than you realized. Internet and television together if added to the more inactive lifestyles of people which further exacerbate the obesity problem.
- Internet has a lot of "cheater" sites. People can buy essays and pass them off as their own far more easily than they used to be able to do.
- There are a lot of dishonest businesses that have sprung up on the internet to take advantage of people.
- Hackers can create viruses that can get into your personal computer and damage valuable data.
- Hackers can use the internet for identity theft.
- It can be quite depressing to be on the internet and realize just how uneducated so many people have become in today's society.

16.3 INTERNET TERMINOLOGIES

The following basic terminologies and tools are used for Internet:

The Server

A server is a computer dedicated to providing some specific service for other computers on the network. Usually a large computer is used as server. Web servers are connected to the Internet 24 hours a day. The server receives requests from different users and provides them information. The server also stores the information and controls all the users that are connected to it.

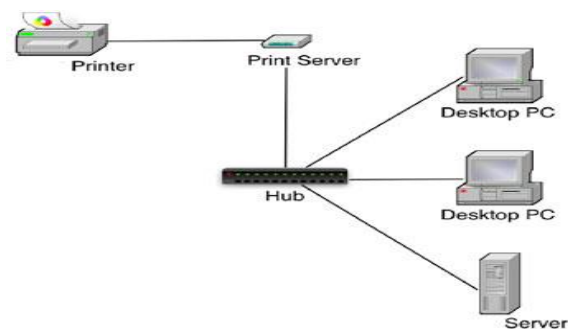
Types of Servers:



- **Print server:** this is connected to the network printers and acts as the go-between for your computer and the printer when you send a document to print. The print server handles the task for you, leaving you free to get on with something else. If a job seems to be taking a long time, then you can normally click on your printer icon in the task bar to have a look at the 'print queue' to see what is holding it up.
- **File server:** This handles the sharing and storing of files on the network. You will normally see 'Network Drives' in Windows Explorer as well as your local 'C' drive. These drives are part of the file server. You can have many file servers on a network.
- **Web Server:** This handles the delivery of web pages and files linked to those web pages. A web server can sit on an Intranet so it remains private to those users. Or it can be connected to the Internet, in which case it will be handling one or more domain names.
- **FTP Server:** Sometimes large files need to be moved from one business to another. In theory an email attachment can be used. But if the file is very large, then it is better to provide an FTP

server that both companies can connect to. After you login, you use an FTP client (File Transfer Protocol) to upload the file. Then the other person uses an FTP client to download it.

- **Video Server:** This is dedicated to streaming video, such as news, films and so on.



The Client

The tools and programs through which the user gets information from server as well as sends information to other users through server is called Client. Usually the personal computer and Browser programs are used to get information from the server.

Hosts

The computers that are connected to the Internet and exchange information between users on the Internet are called Hosts. There is no central computer on the Internet but there are millions of Host computers that can both send and receive information to and from other Hosts connected to the Internet. In this way, each Host on the Internet behaves both as a server and as a Client.

Web Browser

A web browser or simply a browser is application software that allows the Internet user to access and view web pages on the Internet. The process to receive the information of web page from server on the Internet is called downloading. The download process takes few seconds. This time depends on the speed of your Internet connection and the size of graphics that a web page contains. Many web browsers are available but the most commonly used web browsers are Microsoft Internet Explorer and Netscape Navigator.

The mobile devices such as cellular telephones and PDAs use a special type of browser, called a **micro browser**, which is designed for their small screens. Many web sites design web pages especially for display on a micro browser.

Wikipedia (Wiki)

A **wiki** is a website which allows its users to add, modify, or delete its content via a web browser usually using a simplified markup language or a rich-text editor. Wikis are **interactive web pages** that can be **viewed and edited by users**. Wikis are powered by wiki software. Wikis serve many different purposes, such as knowledge management and note taking. Wikis can be community websites and intranets, for example. Some permit control over different functions (levels of access). Anyone with a web browser can visit a wiki and make **changes to the content**. The best known wiki on the web is probably Wikipedia. Wiki has both advantages and disadvantages as shown below:

Advantage

Information is quickly added as many people collaborates their knowledge.

Disadvantage

One of the problems with letting everyone add to the wiki is that sometimes incorrect information is posted.

Blog

A blog is an **online journal** or a **log** where '**bloggers**' write about **topics that are important to** them. Blog's can be about anything that the blogger wants to share with other Internet users and interesting Blog's can attract **millions of visitors**.

Some current popular Blog's include:

- FAIL Blog
- Mashable
- Engadget
- Huffington Post
- TMZ

A Blog is a Website on which an individual or group of users record opinions, information, etc. on a regular basis.

A **blog** is a discussion or informational site published on the World Wide Web and consisting of discrete entries ("posts") typically displayed in reverse chronological order (the most recent post appears first). Until 2009 blogs were usually the work of a single individual, occasionally of a small group, and often covered a single subject. More recently "multi-author blogs" (MABs) have developed, with posts written by large numbers of authors and professionally edited.



Listserv

Listserv is an automatic mailing list server that sends e-mail to subscribers who regularly participate in discussion topics. To subscribe the user sends an e-mail to the list-serve moderator and asks to become a member, after which he or she automatically receives e-mail messages from anyone who responds to the server. Anyone connected to the Internet can subscribe to listserv services. Subscribers receive information on particular subjects and can post e-mail to other subscribers.

Web portal

A **web portal** is a website that brings information together from diverse sources in a uniform way. Usually, each information source gets its dedicated area on the page for displaying information (a portal); often, the user can configure which ones to display.

Apart from the standard search engines feature, web portals offer other services such as e-mail, news, stock prices, information, databases and entertainment. Portals provide a way for enterprises to provide a consistent look and feel with access control and procedures for multiple applications and databases, which otherwise would have been different entities altogether. Examples of public web portals are AOL, Excite, iGoogle, MSN, Naver, Indiatimes, Rediff, Sify and Yahoo.

Bookmark

Bookmark is a way of storing your favorite sites on the Internet. Browsers like Netscape or Internet Explorer let you to categorize your bookmarks into folders.

Web 2.0

Web 2.0 is the term given to the second generation of the Internet. The developments made to Web 2.0 focus on giving people the ability to share information online. Some of these developments include:

- Blog's
- Wikis
- Digital media uploading websites
- Social networking

Digital media sharing websites

These websites allow users to upload video and images which can then be viewed by other people. Video sharing websites, in particular, are helping to change the way in which we can learn on the Internet. For example, YouTube has a huge amount of 'how to' and 'tutorial' videos for all sorts of topics.

One of the advantages of digital media websites is that the owners of the videos and images do not need to waste their own hard drive space storing them.

The files are held '**remotely**' on the websites servers. The best known video sharing website is *YouTube* and for images *Flicker*.

Social networking websites

An online social network, also called a social networking Web site, is a Web site that encourages members in its online community to share their interests, ideas, stories, photos, music, and videos with other registered users. Most include chat rooms, newsgroups, and other communications services.

These websites create 'communities' of people who can share information about their lives, interests and hobbies with each other.

They also make it easy for people to make new friends and to keep in touch with each other no matter where they are in the world.

Common features of social networking websites include:

- **Status updates** - letting friends know what you have been up to
- **Message boards** - where groups of friends can post each other messages
- **Private email** - this allows people to send private messages
- **Video conferencing** - where you can have face-to-face chats using web cams.

The best know social networking websites are Facebook, Twitter and MySpace.

Bandwidth

Bandwidth refers to the range of frequencies used to transmit data, but in computer networking, this term refers to the data rate supported by a network connection or channel. Channel refers to a path through which signal of particular frequency can pass or frequency spectrum occupied by a single communication signal whereas bandwidth is the capacity of the connection or channel. Bandwidth is also known as throughput rate of channel. Mostly Bandwidth is represented in the units of bits/sec or Mbits/sec. The bandwidth is a physical property of the transmission medium and usually depends on the construction, thickness and length of the medium.

Content Aggregator

A content aggregator is a business that gathers and organizes Web content and then distributes, or feeds, the content to subscribers for free or a fee. Examples of distributed content include news, music, video, and pictures. Subscribers select content in which they are interested. Whenever the selected content changes, it is downloaded automatically (pushed) to the subscriber's computer or mobile device.

RSS 2.0

RSS 2.0 stands for Really Simple Syndication, is a specification that some content aggregators use to distribute content to subscribers.

Atom is another specification sometimes used by content aggregators to distribute content. Some current browsers include a feature, such as Internet Explorer's Web Slices, that enables content aggregators to mark sections of their Web pages as feeds to which users can subscribe.

16.3 THE INTERNET PROTOCOLS

The Internet Protocols are set of defined rules and procedures (or software programs) used for communication through which Internet users exchange information on the network.

The first protocol was developed in early 1970s for data communication on network and was named as Network Control Protocol (NCP).

Now-a-days, the commonly used protocols are summarized list of some of the more common protocols used on networks and the Internet. These protocols are used to browse the web, send and receive e-mail, and transfer data files.

- **TCP/IP** - TCP/IP stands for Transmission Control Protocol / Internet Protocol. This protocol enables Users (or provides connectivity between browsers and servers) for data communication on the Internet.
- **NETBEUI** - NetBIOS Extended User Interface (NetBEUI) - and NETBIOS – A small, fast protocol designed for a workgroup network that requires no connection to the Internet.
- **NetBIOS**
NetBIOS is an acronym for **Network Basic Input/output System**. The NetBIOS API allows applications on separate computers to communicate over a local area network. NetBIOS must be enabled for Windows File and Print Sharing to work. NetBIOS provides three distinct services:
 - Name service for name registration and resolution
 - Session service for connection-oriented communication
 - Datagram distribution service for connectionless communication.
- **IPX (Internet Packet Exchange)** is the OSI-model Network layer protocol in the IPX/SPX protocol stack. The IPX/SPX protocol stack is supported by Novell's NetWare network operating system. A protocol used to transport data on a Novell Netware network.
- **SPX (Sequenced Packet Exchange)** is a transport layer protocol (layer 4 of the OSI Model) used in Novell Netware networks. The SPX layer sits on top of the IPX layer (layer 3 – the network layer) and provides connection-oriented services between two nodes on the network. SPX is used primarily by client/server applications.
- **AppleTalk**
AppleTalk is a suite of protocols developed by Apple Computer for computer networking. It was included in the original Macintosh (1984) and is now used less by Apple in favor of TCP/IP networking. AppleTalk contains two protocols aimed at making the system completely self-configuring. The AppleTalk address resolution protocol (AARP) allowed AppleTalk hosts to automatically generate their own network addresses, and the Name Binding Protocol (NBP) was essentially a dynamic DNS system which mapped network addresses to user-readable names.
- **HTTP and HTTPS** – HTTP stands for Hypertext Transfer Protocol and Hypertext Transfer Protocol Secure. It is the latest protocol used for accessing web pages or documents to and from the Web servers. It was developed in 1990 when World Wide Web was introduced. The browser requests document from server through this protocol. The server also returns the required documents to the browser through this protocol.
- **FTP** – FTP stands for File Transfer Protocol. This protocol exchanges files between users. A protocol that provides services for file transfer and manipulation.
- **Secure Shell Protocol (SSH)** - A protocol that is used to connect computers together securely.
- **Telnet** – A protocol that uses a text-based connection to a remote computer.
- **POP** – This stands for Post office Protocol. A protocol used to download email messages from an email server.
- **IMAP** – Internet Mail Access Protocol. A protocol used to download email messages from an email server.
- **Simple Mail Transfer Protocol (SMTP)** - A protocol used to send and receive e-mails in a TCP/IP network.
- **Network News Transfer Protocol** - NNTP protocol is used to exchange messages on the worldwide news bulletin board.

- **User Datagram Protocol (UDP)** – UDP offers a connectionless service to applications. UDP uses lower overhead than TCP and can tolerate a level of data loss. Network management applications, network file system, and simple file transport use UDP. Like TCP, UDP identifies applications by port number
- **Internet Protocol (IP)** – IP provides source and destination addressing. In conjunction with routing protocols, IP provides packet forwarding from one network to another toward a destination.
- **Internet Control Message Protocol (ICMP)** – ICMP is used for network testing and troubleshooting. It enables diagnostic and error messages. ICMP echo messages are used by the ping application to test if a remote device is reachable.
- **Routing Information Protocol (RIP)** – RIP operates between router devices to discover paths between networks. In an intranet, routers depend on a routing protocol to build and maintain information about how to forward packets toward the destination. RIP chooses routes based on the distance or hop count.
- **Address Resolution Protocol (ARP)** – ARP is used to discover the local address, the MAC address, of a station on the network when its IP address is known. End stations as well as routers use ARP to discover local addresses.

Revision Questions

- 1 Define network protocol
- 2 Differentiate between each network environment and the protocol used
 - Apple Filing Protocol (AFP)
 - IPX/SPX
 - TCP/IP
- 3 Explain why TCP/IP Protocol is widely used and the configuration process
- 4 Explain the differences between IPv4 and IPv6
- 5 Describe the differences between Bluetooth and IEEE 802.11x Cellular RF properties
- 6 Compare the differences between Broadband, Digital Line Subscriber (DSL), dial-up, and satellite technologies.
- 7 Explain the basics of Network Operating Systems (NOS)
- 8 Describe the principles of data integrity and protection
- 9 Describe the principles of network security for wired and wireless networks
- 10 Explain the need for a network firewall
- 11 Explain the different types of encryption used in Wi-Fi equipment
 - WEP
 - WPA
 - WPA2

12 Explain the purpose for wireless encryption keys

- Temporal Key Integrity Protocol (TKIP)
- Advanced Encryption Standard (AES)
- Counter Mode with Cipher Block Chaining Message Authentication Code Protocol (CCMP)

13 Explain the differences between Laptop and Tablet

Web Page

Web page is a stored document on the World Wide Web which contain text, graphics, animation, audio, and video. The documents on the Web are also called Web pages and are stored on computers (Web servers) that are permanently connected to the Internet. The process to store your Web page the Web server is called **Publishing** or **Uploading**.

Similarly, retrieving Web document from server to client computer is called **downloading**. Most Web pages are stored on the Web servers or HTTP servers but these can also be stored on different servers e.g. FTP servers or Intranets etc.

Web Site

A collection of related Web pages stored on a Web server is called Web site. The browser program is used to access Web pages. A Web site may contain many Web pages. The main page or title page that contains the links of other Web pages is referred to as Home Page. The Home page is downloaded first when you enter the URL address of the Web site. The other pages of the Web site are visited, through Home page because it contains the links of other pages.

Home page

This is the welcome or first page of a website that contains the key features for navigations like site maps and link buttons to other pages.

Hyperlink

This is a link from a hypertext file or document to another location or file, typically activated by clicking on a highlighted word or image on the screen. Hypertext is text with hyperlinks.

Uniform Resource Identifier (URI)

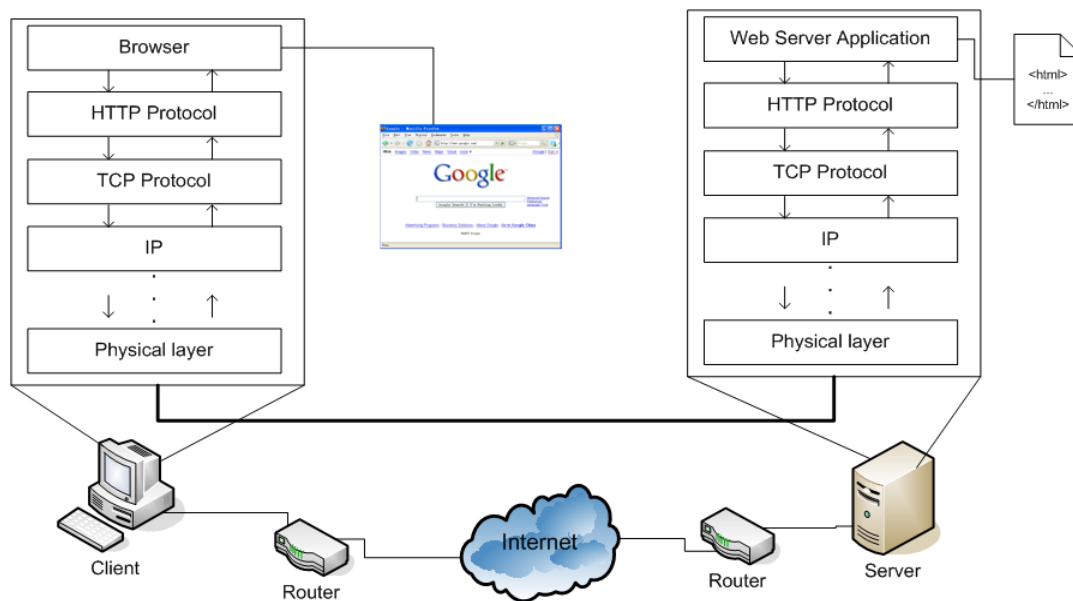
A Uniform Resource Identifier (URI) is a compact string of characters used to identify or name a resource. Each document/resource on the WWW needs to have an identifier in order to be accessed by others.

Uniform Resource Locator (URL)

A Uniform Resource Locator (URL) is a URI which provides means of obtaining the resource by describing its network “location”.

Two things are given by the URL:

- Exact location of the document
- The method or protocol by which to retrieve and display the document



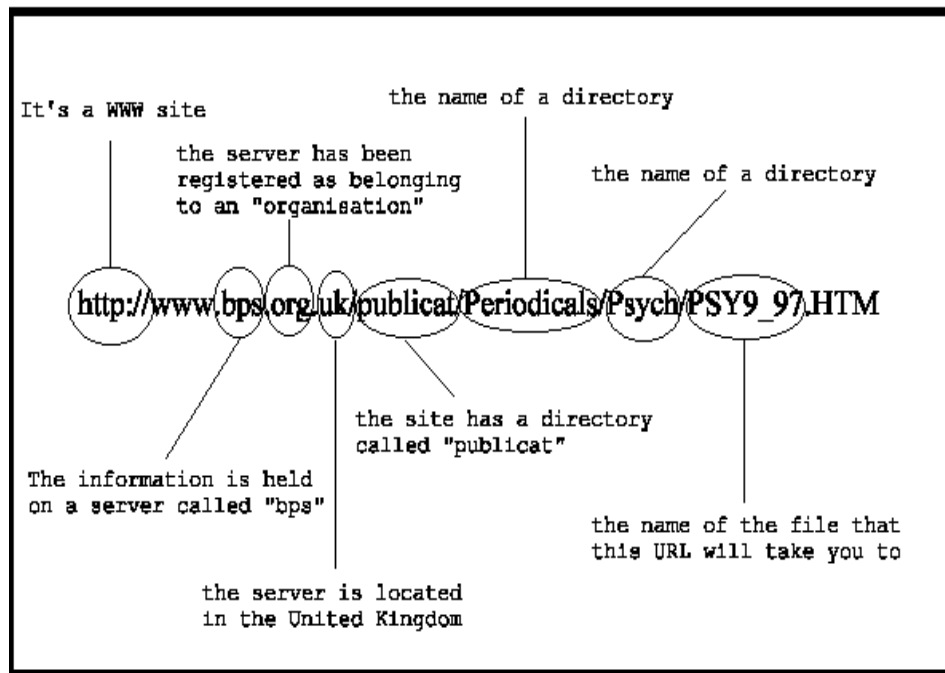
URL Address

Uniform Resource Locator address is a unique address of web page or any other file on the Internet. It is used by the browser of client computer to access or find the documents stored on the Host or Web server. Following are some important URL addresses:

- <http://www.savings.gov.pk>
- <http://www.yahoo.com>
- <http://www.hotmail.com>

As shown in the above URLs, each URL may have the following parts:

- Prefix with protocol identifier, such as “http” or “ftp” followed by a colon and double slashes (//) e.g. **http://**.
- The domain name – specifies the host name / domain name e.g. **www.savings.gov.pk**
- The path of the document. The forward slash (/) character is used in the document path. **/~lokot/cs134/index.html** – specifies the path of the document on the host



Domain Name

The name assigned to the computer (server) on the Internet that exchanges Information is called the domain name. It is a common and unique text name. It is also known as the Internet name of the computer.

A **domain name** may consist of different parts but it is commonly divided into two parts, e.g. *cs.mak.edu*

Top-level domain

The rightmost label conveys the top-level domain, e.g. *edu*

Sub-domain

Sub-domain is the name of the host computer connected to the Internet. Each label to the left specifies a subdomain, in our example, subdomain is *mak* (University of Makerere), and sub-subdomain is *cs* (computer science).

Top-level domain (TLD)

TLD comes at the end of domain name separated with dot (.) and specifies the type of domain such as type of organization. The commonly used TLDs are:

- "com" specifies the domain for commercial.
- "gov" specifies the domain for government department.
- "net" specifies the domain for networking company.

For example, in the domain name *microsoft.com*, "com" is the TLD and sub-domain is the "Microsoft". The organization that assigns and controls top-level domains is the Internet Corporation for Assigned Names and Numbers (ICANN pronounced EYE-can). For international Web sites outside the United States, the domain name also includes a *country code TLD* (ccTLD), which is a two-letter country code, such as *au* for Australia. Some smaller countries have granted use of their ccTLDs for commercial purposes, such as *tv*(Tuvalu) for the television/entertainment industry.

Examples of Generic Top-Level Domains

Generic TLD	Intended Purpose
aero	Aviation community members
biz	Businesses of all sizes
cat	Catalan cultural community
com	Commercial organizations, businesses, and companies
coop	Business cooperatives such as credit unions and rural electric co-ops
edu	Educational institutions
gov	Government agencies
info	Business organizations or individuals providing general information
jobs	Employment or human resource businesses
mil	Military organizations
mobi	Delivery and management of mobile Internet services
museum	Accredited museums
name	Individuals or families
net	Network providers or commercial companies
org	Nonprofit organizations
pro	Certified professionals such as doctors, lawyers, and accountants
tel	Internet communications
travel	Travel industry

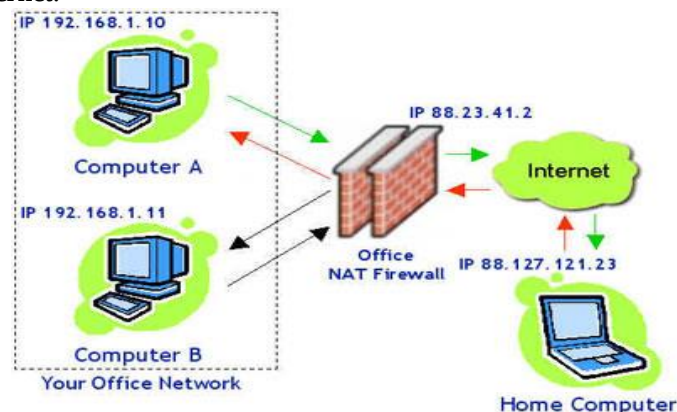
Domain Name System (DNS)

Domain Name System is a mapping between the human-readable name (domain name) of a host and its IP address.

A domain name system (DNS) is also the method that Internet use to store domain names and their corresponding IP addresses, When a domain name is given to the browser, a DNS server translates the domain name into its associated IP address and then the connection is established to the correct computer on the Internet. A DNS server is an Internet server that is associated with an Internet Access Provider.

IP Address

It stands for Internet Protocol address. *IP address is a unique address that identifies a computer on a network such as the Internet.*



IP Address

Address is an internet address of any computer which is connected with internet. Every communication on internet based on IP address. Every device or computer connected with internet has unique and public IP address.

An IP address is represented as a 32-bit binary number, divided into four **octets** (groups of eight bits):

IP address has 2 versions, the first and classic is IPv4 (32 bits) e.g. 100.3.20.4 and 2nd is IPv6 (128 bits) e.g. 2001:1:5F3A:0:206:AE14

Example: 10111110.01100100.00000101.00110110

Each computer on the Internet is also assigned a numerical address or a dotted decimal format as alternate of domain name, e.g. 102.104.70.02 (four numbers separated by dots), 190.100.5.54, etc.

- When a host is configured with an IP address, it is entered as a dotted decimal number, such as 192.168.1.5.
- Unique IP addresses on a network ensure that data can be sent to and received from the correct network device.

ISP's and networking companies' purchase IP ranges from **IANA** (Internet Assigned Numbers Authority) and distribute or sale their IPsec to their clients. Online Web Servers, Mail Servers and Data Servers etc. need public IP. If you want to stand your own email or web server then you need to buy a dedicated (Fixed) and public IP from your ISP.

You can also give the IP address of domain name as URL but it creates problem for users to remember the correct IP address of domain. The domain common name is easy to remember.

IP Address Classes

IP Address Class	Application
Class A	Large networks, implemented by large companies and some countries
Class B	Medium-sized networks, implemented by universities
Class C	Small networks, implemented by ISP for customer subscriptions
Class D	Special use for multicasting
Class E	Used for experimental testing

Subnet Masks

Used to indicate the network portion of an IP address

- Is a dotted decimal number

Usually, all hosts within a broadcast domain of a LAN (bounded by routers) use the same subnet mask.

The default subnet masks for three classes of IP addresses:

- 255.0.0.0 is the subnet mask for Class A
- 255.255.0.0 is the subnet mask for Class B
- 255.255.255.0 is the subnet mask for Class C

If an organization owns one Class B network but needs to provide IP addresses for four LANs, the organization will subdivide the Class B network into four smaller parts by using subnetting, which is a logical division of a network. The subnet mask specifies how it is subdivided.

IP Address Configuration

- Manual configuration

Manually configure each device with the proper IP address and subnet mask.

- Dynamic configuration

A Dynamic Host Configuration Protocol (DHCP) server automatically assigns IP addresses to network hosts.

Network Interface Card (NIC) is the hardware that enables a computer to connect to a network and it has two addresses:

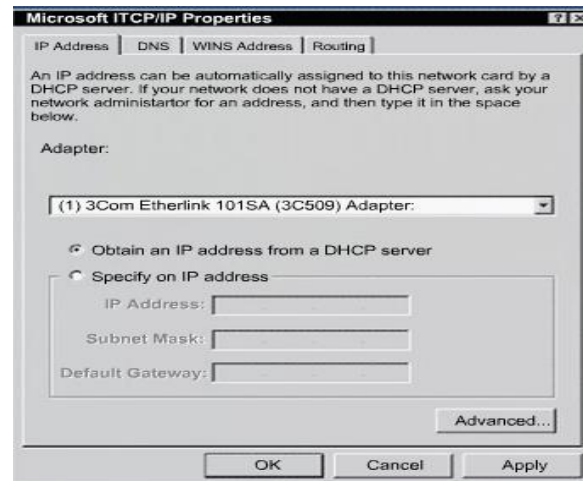
- The IP address is a logical address that can be changed.
- The **Media Access Control (MAC) address** is "burned-in" or permanently programmed into the NIC when manufactured. The MAC address cannot be changed.

Dynamic Host Configuration Protocol (DHCP)

DHCP automatically provides computers with an IP address. The DHCP server can assign these to hosts: IP address, Subnet mask, Default gateway and Domain Name System (DNS) server address

DHCP Process and Advantages

The DHCP server receives a request from a host. The server then selects IP address information from a set of predefined addresses that are stored in a database. Once the IP address information is selected, the DHCP server offers these values to the requesting host on the network. If the host accepts the offer, the DHCP server leases the IP address for a specific period of time.



Using a DHCP server simplifies the administration of a network because the software keeps track of IP addresses. Automatically configuring TCP/IP also reduces the possibility of assigning duplicate or invalid IP addresses. For a computer on the network to take advantage of the DHCP server services, the computer must be able to identify the server on the local network. A computer can be configured to accept an IP address from a DHCP server by selecting the "Obtain an IP address automatically" option in the NIC configuration window.

If your computer cannot communicate with the DHCP server to obtain an IP address, the Windows operating system will automatically assign a private IP address.

If your computer is assigned an IP address in the range of 169.254.0.0 to 169.254.255.255, your computer will only be able to communicate with other computers in the same range.

An example of when these private addresses would be useful is in a classroom lab where you wish to prevent access outside of your network. This operating system feature is called Automatic Private IP Addressing (APIPA).

APIPA will continually request an IP address from a DHCP server for your computer.

Configure Host to Use DHCP

For a computer on the network to take advantage of the DHCP server services, the computer must be able to identify the server on the local network. A computer can be configured to accept an IP address from a DHCP server by selecting the "Obtain an IP address automatically" option in the NIC configuration window.

The Hyperlinks

The method that allows creating link of one section of document to another section or to another document is called the hyperlink or simply it is called link. The hyperlink may be created on any text or picture. The mouse pointer changes its shape (usually changes to hand. shape) when it is over the link. It shows that the text or image is clickable. When the link is clicked, you jump to the section or document that has the address under the link. Under the link, there may be URL of any web page or the specific section name of the same document.

Voice over Internet Protocol (VoIP)

VoIP stands for 'Voice over Internet Protocol'. It is a technology that allows you to make telephone calls over a Broadband internet connection.



The Internet is designed to send data from one computer to another. It does not care in the slightest what that data actually is - so it could just as easily represent your voice.

The technology is fairly straight-forward:

- You speak into a microphone that is connected to a sound card.
- The sound card has an 'Analogue-to-Digital converter' that translates your speech into a digital stream.
- That data is given a destination address and off it goes like any other data stream.
- The receiving computer has the right VoIP software to convert the incoming data back into speech

Advantages

- The advantage of VOIP using the internet is that at its most basic the system is essentially free as long as you have an Internet connection.
- The next step-up is to use a VOIP service company such as Skype. They may offer a free service if you call other subscribers and then charge for other calls.

Disadvantages

- Both ends have to have the right software and hardware to speak to one another
- There is no guarantee of quality when using the Internet - no one company owns the internet, so if a part of it is broken there is no-one to call to fix it.
- It uses packet-switching so if packets get dropped along the way then voice quality drops.
- Even when fully working, it is not as high a quality of voice as a normal telephone line.
- It does not work if you have a power-cut, unlike your normal telephone.
- It may not work for emergency service numbers. Sometimes you just can't tell the emergency services where you are, so they use some standard telephone location technology to help locate you. With VOIP this is more difficult.

16.4 INTERNET SERVICES

The Internet has grown from a small project to today's biggest network of computers. Due to this colossal growth, the Internet has become the biggest domain of information.

Nowadays, an Internet user has access to a wide variety of services such as electronic mail, file transfer, vast information resources, interest group membership, interactive collaboration, multimedia displays, real-time broadcasting, shopping opportunities, and much more. Some of the important services provided by the Internet are:

World Wide Web (WWW)

The World Wide Web is simply referred to as Web. It is the latest addition to the Internet to exchange information. The Web is vast network of HTTP servers (Web servers) that store documents called Web pages and these are accessible on the Internet. It is abbreviated as www or 3w. It is the easiest way to search and to get information on the Internet.

File Transfer Protocol (FTP)

It is a way to transfer files to others through Internet. The files are stored on a special type of server called the FTP server. The browsers can be used to transfer files from FTP server to the client computer but it is a slow process to transfer files. A lot of FTP client programs of different Software Companies are available through which files can be downloaded from FTP server into your local computer very easily and quickly. Similarly, the files from your computer can be uploaded to the FTP server. These special programs are WS_FTP and Cute FTP.

Internet Relay Chat (IRC)

Internet Relay Chat or simply Internet chat is an Internet facility that enables two or more people to participate in real-time online discussions.

Internet Relay Chat (IRC) is a system for sending public and private message to other users in "real time" – that is, your message appears on the recipient's screen as soon as you type it.

There are many chat systems, including Internet Relay Chat (IRC), America Online (AOL) Chat, Facebook, Yahoo Messenger and Microsoft Chat. The different systems are very similar, but users can generally only chat with other people who are using the same system. Each chat system may have thousands of users spread throughout hundreds of chat rooms. A chat room is an area on the web where you talk with people online. You send messages by typing with keyboard to the online people and receive messages from other end instantly. Some chat rooms support voice chats and video chats where you talk with people as well as see them.

Chatting and Instant Messaging

Chat programs allow users on the Internet to communicate with each other by typing in real time. They are sometimes included as a feature of a website, where users can log into chat rooms to exchange comments and information about the topics addressed on the site.

Internet Telephony

Internet telephone is the use of the Internet rather than the traditional telephone company infrastructure, to exchange spoken or other telephonic information. It consists of hardware and software that enable people to use the Internet as a transmission medium for telephone calls.

There are many Internet telephony applications available. Some, such as Cool Talk and NetMeeting, come bundled with popular web browsers.

Electronic Commerce (e-Commerce)

E-Commerce or Electronic Commerce is very important service provided by Internet through which financial transactions are carried out over the Internet. It is the modern way to carry out business on international basis. When business is conducted with the help of computer networks, this activity is usually termed as e-commerce or e-trade. Through e-commerce, goods can be purchased and sold from anywhere in the world. Credit cards are used for payments. It is estimated that the size of e-commerce is growing at a rate of 10% to 15% per month in the world.

The e-commerce can only be conducted on the computer network. Therefore, computer network has become the need of every nation including Pakistan. The examples of E-commerce are; online shopping, online advertising, online banking etc.

Videoconference

Video conferencing uses the same technology as IRC, but also provides sound and video pictures. It enables direct face-to-face communication across networks. A video conferencing system has two or more parties in different locations, which have the ability to communicate using a combination of video, audio, and data. A video conference can be person to person (referred to as “point-to-point”) or can involve more than two people (referred to as “multipoint”) and the video conferencing terminals are often referred to as “endpoints”.

Videoconferencing is the conduct of a videoconference (also known as a video conference or video teleconference) by a set of telecommunication technologies which allow two or more locations to communicate by simultaneous two-way video and audio transmissions. It has also been called 'visual collaboration' and is a type of groupware.

Telnet

Telnet is an Internet service (or tool) that is used to login and run commands or programs on a remote server on the Internet. Through this service, you can also access information on the Internet. You run the telnet client application on your computer. The telnet provides you a prompt on your screen and you can access the host computer by giving commands through this prompt. You will feel that you are sitting in front on the host computer and operating it. When you send commands to the host through this service, information are accessed from host and displayed on your own computer screen.

When telnet client program is run on your local computer, you have to give your account name (user name) and password to start the operating session. The expert users mostly use this service. In some remote servers, this service is not allowed.

Gopher

Gopher is an Internet service that organizes resources into multilevel menus to make finding information easier on the Internet. Before Gopher, it was difficult to find information on the Internet.

Electronic Mail (e-mail)

E-mail is the most popular service or facility provided by the Internet through which we can electronically send and receive messages anywhere in the world. E-mail is a fast and efficient method of communication. It is almost free of cost. The e-mail reaches to the destination in a few seconds. You can also send documents, pictures, audio and video files via e-mail by attaching the file with email. It is also possible to send or receive e-mail messages through a mobile phone.

Online Shopping

Newsgroups (Usenet)

Newsgroups are international discussion groups that focus on a particular topic and helps in gathering information about that topic. The topics discussed here cover all the fields such as

politics, computers, technology, and many more. The information or articles that make up the “news” are written by people interested in a specific topic. These articles are posted to the newsgroup so that others can read, reply, and comment on them.

Mailing Lists (List server)

The Internet is home to a large community of individuals who carry out active discussions, organized around topic-oriented forums that are distributed via e-mail. This method of Internet communications is known as mailing list and it enables people with similar interests from all over the world to communicate and share information with each other.

ACCESSING INTERNET

Applications that enable user to access the Internet are called web browsers. E.g. Netscape, Navigator, Internet explorer.

Login / Sign in

To access a website, type the full address of the website in the address bar then press enter key. Some website allows free access to all their pages by all visitors. However other require people to be members hence new visitor has to register (sign up). The registration process give the visitor a user name, pass word that can be used to sign in or log on the website for each visit.

Surf / Browser

Surfing /Browsing is the process of accessing Internet resources like web pages and websites.

Hyperlinks and Search Engines

A hyperlink is a text or a picture on electronic document, especially web wipe that causes web pages to open when the link is clicked.

Down loading

After searching and finding information on the net, you may want to save the information locally on your computer. The process of transferring the information from remote computer to local storage id called

Downloading

Uploading

Uploading is the transmission of a file from one computer system to another, usually larger computer systems.

16.5 WORLD WIDE WEB (WWW)

The **World Wide Web** is also called **Web** that emerged in the early 1990s is a system of *interlinked, hypertext documents* accessed via the Internet. It is a service of the Internet that provides the facility to publish information on Internet. The Web consists of a worldwide collection of electronic documents or web pages stored on computers permanently connected with Internet around the world. These web pages are connected to one another using **hyperlink**; *built-in connections*. Anyone can view these web pages through a web browser.

Each electronic document on the Web is called a Web page, which can contain text, graphics, animation, audio, and video. Additionally, Web pages usually have built-in connections to other documents.

A collection of related web pages is called **website**. Each website has a unique address. The address of a website is called **URL**. It stands for **Universal Resources Locator**. Following is an example of www: <http://www.nssfug.gov.ug>

Elements of WWW

World Wide Web uses several technologies, programming languages, interfaces and devices to bring the ocean of information on your desk. WWW mainly relies on the following to make rapid access to information:

- Webserver
- Web browser
- Website
- Hypertext and Hypermedia
- Hyperlinks
- Hypertext Transfer Protocol (HTTP)
- Search Engines
- Addressing Schemes

The uses of WWW are as follows:

- **Advertisement** - Manufacturers use WWW to provide information of their products.
- **Shopping** - It is possible for user to buy an item using WWW. You can see products and prices, and even order them by using your credit card etc.
- **Flight Information** - It is used to provide the latest information on flights arrivals and departures.
- **Television Station** - WWW is used to provide information about the programs, latest news and special events. Some television show different events live on their websites.
- **Celebrities, Sportsman and Film Actors** - Important celebrities can contact their fans, provide information about them and send their pictures.
- **Government Authorities** - Government authorities can provide information about services and facilities for the people.
- **News** - Most newspapers have their website. Latest news and interviews are provided on these websites.
- **Encyclopedia Publisher** - Online encyclopedias are available. You can find detailed information on any topic in the world.
- **Search Engines** - Search engine is a website that provides the facility to find the required websites on a particular topic. You can find thousands of websites about any topic.
- **Medical** - Many sites in the world provide detailed information on diseases. You can also consult a panel of on-line doctors to get the advice about any medical problem.

16.6 ELECTRONIC MAIL (E-MAIL)

Electronic mail, commonly referred to as **email** or **e-mail**, is a method of exchanging digital messages from an author to one or more recipients over electronic networks like the internet. Modern email operates across the Internet or other computer networks.

Email is actually the exchange of text messages, files, pictures, videos, audio songs through Internet. Message can be in the form of graphics, sounds, video clips or simple text. It is a fast way of delivering messages anywhere in the world in a very short time.

It is the most popular service or facility provided by the Internet through which we can electronically send and receive messages anywhere in the world. E-mail is a fast and efficient method of communication. It is almost free of cost. The e-mail reaches to the destination in a few seconds. You can also send documents, pictures, audio and video files via e-mail by attaching the file with e-mail. It is also possible to send or receive e-mail messages through a mobile phone.

E-mail Address

E-mail address is a unique e-mail account on an e-mail server that consists of username and address on the Internet. E-mail is sent and received with the reference of e-mail address. Therefore each Internet user

must have a unique e-mail account on an e-mail server, to send and receive e-mails. The two general format of an e-mail address is: **username @ domain_name** where

- **Username or user ID** - Specifies the name of user or organization.
- **Domain_name** or identity of email service - Specifies the name of server or ISP of which the user is member.

These two parts are separated by the symbol @ e.g. lokot@email.info, laokot@gmail.com, laurieboy44@yahoo.co.uk, lokot2@hotmail.com

In this example, **lokot** is called user ID. It is used to sign into email service. The symbol @ is called "at" sign. It separates the account ID from the name of the e-mail service provider **email.info** indicates the email service provider.

Typically an email address can be got from your Internet Service Provider, company, school, or a Web-based email service such as Hotmail or Yahoo Mail.

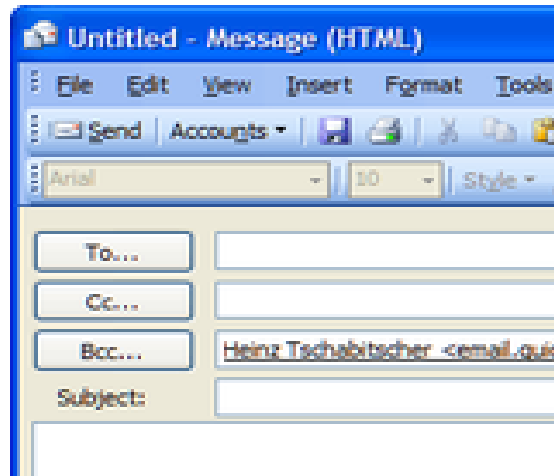
Components of an email message

An email message consists of the following general components: *Header* and *Body*

Headers

The message headers contain information concerning the sender and recipients. The exact content of mail headers can vary depending on the email system that generated the message. Generally, headers contain the following information:

- **Subject**
Subject is a description of the topic of the message and displays in most email systems that list email messages individually. In this textbox a subject line could be something like "2007 company mission statement" or, if your spam filtering application is too lenient, "Lose weight fast!!! Ask me how."
- **Sender (From)**
This is the senders Internet email address. It is usually presumed to be the same as the Reply-to address, unless a different one is provided.
- **Date and time received (On).** The time the message was received.
- **Reply-to.** This is the Internet email address that will become the recipient of your reply if you click the Reply button.
- **Recipient (To:)** It is a text box used to enter the e-mail address of person to whom you want to send mail as configured by the sender. More than one e-mail addresses separated with commas can be entered into this box.
- **Recipient email address.** The Internet mail address of the recipient, or where the message was actually sent.



- **CC** - CC stands for carbon copy. It is used to write e-mail address of another person.
- **BCC** - BCC stands for blind carbon copy. It is same as CC but email address given in this field is not shown to the other recipients.

Message Box - The main message is typed in this main box.

Send Button - Used to send the e-mail created.

Delete Button - Used to delete the e-mail.

Inbox

It is an element of Email Application which collects all incoming mails.

Outbox

It is an element of Email Application which collects all outgoing mails, if it is created and sent in offline.

Trash

This is an element of Email Application that holds all the deleted emails.

Emoticons

The convention of expressing feeling or a joke in symbolic form by user in Email or Chatting for example :-) for smiling ;-) for winking :- (for frowning etc. are emoticons.

E-mail is a document communication facility. To ensure that the recipient also understands the emotions as well, a set of special symbols is used to convey some non-verbal signals. A few of such symbols are given below:

Symbol	Emotion
:-	Humor
:)	Smile
:(	Frown
:/)	Not funny
p-	Private
: *	Kiss
(: - (	Very sad

Body

Body is the main part of an email message containing the actual, arbitrary data such as text or images. As opposed to the header, this contains control and meta-information. The body of a message contains text that is the actual content, such as "Employees who are eligible for the new health care program should

contact their supervisors by next Friday if they want to switch." The message body also may include signatures or automatically generated text that is inserted by the sender's email system.

E-Mail Attachment

An attachment is an additional file that is sent along with an email message. The file can be of any type for example documents, pictures or images, and audio and video files via e-mail, anywhere over the network. Attachment size varies from one e-mail service provider to the other.

Attaching files to your message

Email messages can include attachments. You can attach documents, spreadsheets, pictures, slide shows and other types of files.

To attach a file to a message:

- Compose the message
- Click  **Add Attachment**. The Attach File(s) dialog appears.
- Click **Browse...** to locate the file.
- Select the file and click **Open**. The file name appears in the first **Attach** field.
- To attach another file, click **Browse...** again.
- When all attachments are selected, click **Attach**. The files are added to the email message and listed under the subject.
- When the message is ready to be sent, click **Send** to send the message and the attachments.

Advantages of attaching documents to an e-mail

- Additional file that is sent along with an email message

Disadvantages of attaching documents to an e-mail

- Can attach a file containing a computer virus
- It has limited amount of data it can take
- It sometimes takes too long to upload and download
- Attaching files take very many steps to attach and download
- Recipients need relevant software to download and open e.g. Winzip, Winrar, etc.

Replying E-Mail

Sending back an e-mail that one has received to the sender person with new message is called replying e-mail. When you select a message sent by you and click Reply icon, Microsoft Outlook Express opens a New Message window. All the fields of the composing window will be filled with the information sent by sender. For example, email address of the sender is filled in "To:" and so on. Type new message and click the Send button to send the message.

Forwarding E-mail

Resending an e-mail message that one has received to another person is called forwarding e-mail. When you select a message sent by you and click Forward icon, Microsoft Outlook Express opens a New Message window containing the original message. Enter the e-mail address(s) and click the Send button to send the message. You can also forward an e-mail message with attached file by choosing "Forward As Attachment" from Message menu.

Checking Mail

In order to check mail the user has to open the e-mail account by providing the correct user name and password. In e-mail account, click the Inbox command to view a link list of all received mails.

Compose a mail

Composing implies writing. To compose a message, click the compose command.

Send mail

To send mail, type the correct e-mail address of the recipient in to: text box, type four letters then click **send** command.

On-line meeting

It's possible to hold on-line meeting with people by sending mails to them. E.g. on-line interviews may involve a person sending electronic mail composed of interview questions to a recipient who can read and answer back.

Telephone messages

Wireless Access protocol (WAP) makes it possible to send e-mail to a mobile handset and a mobile message to e-mail account.

Contact Management

Most mails programs allow the user to develop an address book which holds contact information like e-mail address of a different people.

Accessing information on Emerging Issues

Internet is a storehouse of information, presented in the form of text, documents, pictures, sound and even video. The Internet has a wide range of information concerning the issues. Emerging issues refers to things like HIV/Aids, drug abuse, Moral issues. Etc.

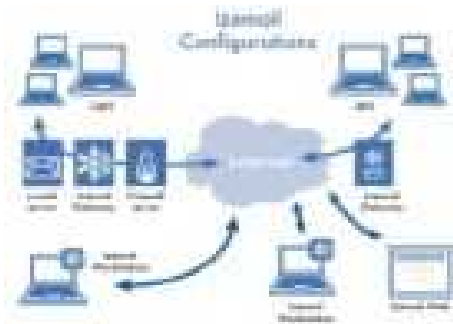
How does E-mail work?

The first thing to be done is to type the message and the e-mail address of the recipient. Once the 'send' button is clicked, this e-mail is sent through the telephone line after its conversion into analog signal by the modem. The e-mail message arrives at our service provider's server. If the server recognizes the e-mail address as valid, the mail will be sent either through the network of the service provider or through internet gateway to the service provider of the recipient.

To send e-mail, we need a connection to the internet and access to a mail server that forwards the mail. The standard protocol used for sending internet e-mail is called SMTP, short for Simple Mail Transfer Protocol. It works in conjunction with POP servers. POP stands for Post Office Protocol.



When we send an e-mail message, our computer routes it to an SMTP server. The server looks at the e-mail address (similar to the address on an envelope), then forwards it to the recipient's mail server. Once the message arrives at the destination mail server, it's stored until the addressee retrieves it. We can send e-mail anywhere in the world to anyone who has an e-mail address.



E-mail route

With the advent of MIME, which stands for multipurpose Internet Mail Extension, and other types of encoding schemes, we can not only send messages electronically, but we can also send formatted documents, photos, sound files, and video files.

Advantages of E-mail

There are several advantages of the e-mail facility available on the Internet. The main advantages of e-mail are:

- Fetching new mail - If you've got new mail in your mailbox, you go and fetch it. Similarly, your email program can check for new email messages at your mail server and download them for you to read.
- It is extremely fast and reaches to the destination in a few minutes or even in few seconds. Typically, it takes 1 to 5 minutes to reach a destination in Europe (USA, England etc.) from Uganda.
- Its cost is very low. It is almost free.
- One message can be sent to many persons with a single e-mail.
- It is available round the clock and round the globe.
- You can send and receive e-mail from anywhere in the world.
- Attachments - You can attach any file on your computer to an email message easily, regardless of its type and, mostly, size. It's as easy to send a long master's thesis around the world as it is to email a spread sheet, a report, pictures, or a saved game of your favorite game.
- It is also possible to send or receive e-mail messages through a mobile phone.

Disadvantages of E-Mail

Although e-mail, provides the fast and efficient way to send and receive messages. It also has some limitations. These are described below:

- **Lack of Privacy**
Email does not provide high privacy. An email passes from one system another through different networks. The system administrator of a network or a hacker can read the contents of emails.
- **Junk Email**
Junk email is an unwanted email. It is also known as **spam**. A person may send such email that the receiver does not want to read. Sometimes junk emails are in such number that it fills the space of email account.
- **No Emotions**
An email message cannot express your emotions properly. The receiver cannot view the facial expression or voice of the sender. Secondly the receiver may interpret a humorous message wrongly.
- **Possible Delay**
Email is read when the user connects to the Internet and checks email account. An urgent message may be ignored or delayed if a person does not check his email account soon.

Communication Problems

Email may not be delivered successfully due to communication errors. Some other limitations are as follows:

- Some email systems can send or receive text files only.
- A person can send email message with wrong details. It is difficult to know sender.

Free E-mail Account

Although we are provided with an e-mail account when one join any local ISP company, there are also some websites that provide facility to Internet users to create their own e-mail account, free of cost. The most popular websites are:

<http://www.gmail.com>
<http://www.yahoo.com>
<http://www.hotmail.com>

To create new e-mail account on the Hotmail, follow these steps.

- Open the Hotmail website.
- Click the Sign-up link for an E-mail account, a registration form will be displayed.
- Fill the form correctly and send to the Hotmail server, your e-mail account is created.

After creating of your e-mail account, you are allotted a. username and password. You can check 'your e-mail account by entering the correct username and password. You can also compose and send the e-mail from your free e-mail account as well as you can manage your mails. The main difference between e-mail account provided by local ISP and free e-mail account is that:

Infrastructure Requirement for E-Mail

- Personal Computer
- Telephone Connection
- Modem
- Mailing software viz., Outlook Express or Netscape communicator or Internet Explorer

Microsoft Outlook Express

Microsoft Outlook Express is a utility program that is used to send and receive e-mails and to manage newsgroups. It is built-in utility program of Windows.

To open Microsoft Outlook Express, follow these steps.

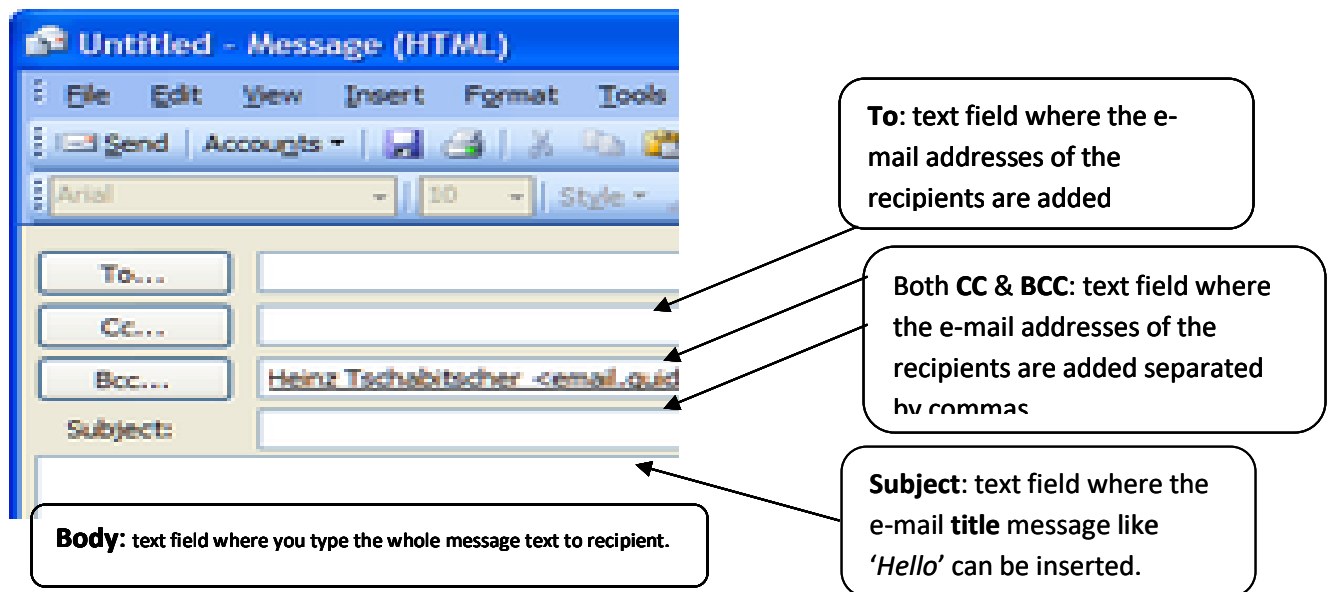
- Select "Programs" from Start menu.
- Select "Microsoft Outlook Express" from "Programs" menu.

OR

- Click mail Button on the toolbar of Internet Explorer.

Composing and Sending E-mail

Composing e-mail means to prepare a message that is to be sent. It is composed very easily in any e-mail utility program. The free mail service also has this facility, when any one of the e-mail programs is used to prepare the e-mail, a window is opened that has the following elements:



Information about email addresses and email service

Bulk email - Email service - Email address - Free email address- Mail server - Fax email - Email - Email account - Mail

Working of Email

An email program can be used to send email. It is also known as **email client**. The personal computer connects to a mail server for sending email messages. **Email server** is a host computer on the Internet that is used to send and receive emails. Any person can send an email to any valid email address. The email server receives the message and the email address. It finds out the email server where that email address exists. It then sends the copy of the email message to that email server.

MIME is an Internet protocol that supports email attachments. It stands for **Multipurpose Internet Mail Extension**. Different websites provide different file size that can be attached with an email message. Yahoo provides attachment size of 10MB.

Email terms

Phishing

Phishing is a fraudulent practice in which secret data is captured on web sites designed to look like a trusted third party.

Typically, phishing (from "password fishing") scams involve an email alerting the user to a problem with their bank or some web site account. The user is led to a page that mimics the secure and trusted site exactly, but is hosted by the scammer. User names and passwords entered on a phishing site are captured.

Pharming

The intention of pharming is the same as phishing that is to obtain personal information such as **usernames**, **passwords** and **bank details** etc. Pharming usually targets users of online banking or shopping websites.

The way this is done however is slightly different. '**Pharmers**' infect **legitimate websites with malicious code** that will re-direct you to their **bogus version of the website**.

The bogus website will look very similar, or even identical, as the legitimate website. This makes pharming very dangerous and difficult to detect.

Ways to reduce the risk of getting 'pharmed'

Check the **url (web address)** of the website before you enter personal information. The **bogus website** will usually have a slightly different address to the legitimate website.

Make sure that you are on a secure website before entering personal information. The way to tell is to look at the url:

- A secure connection's address will begin with https
- An unsecure connection will begin with http

Spam

Spam is '**junk email**' that is **sent automatically to thousands, or even millions, of email inboxes**. Spam over-runs your inbox very quickly and it is a pain to have to delete all of these unwanted emails every day.

'**Spammers**' send these unwanted emails for a range of different reasons including:

- Advertising low quality products
- Spreading viruses
- Phishing purposes

Spammers get your email address from a range of sources. This is called '**harvesting email addresses**'.

The sources include:

- Mailing lists
- Chat rooms
- Programs that scour websites for email addresses
- Bought illegally from dishonest employees of internet companies

Spam is unsolicited email. Not all unsolicited email is spam, however. Most spam is sent in bulk to a large number of email addresses and advertises some product or -- far less often -- political viewpoint.

Spam is an email message that you did not ask for and do not want from somebody you do not know, who wants to sell you something. Spam is also known as UBE, UCE, unsolicited bulk email, unsolicited commercial email.

Spammer is someone who sends spam.

Ways to reduce the risk of spam

- Spam filters are included with most email accounts. These can be used to automatically separate junk email from legitimate emails. You can then quickly delete the contents of the junk email folder.
- Don't post your email address in public websites like chat rooms or social networking sites.

Web-based Email

This is an email account that is accessed through a Web browser. The interface is implemented as a Web site that provides access to the various functions like reading, sending or organizing messages. Emails are typically not downloaded to the user's computer but stored on the Web-based email service provider's servers. Popular examples of Web-based email services include Hotmail and Yahoo Mail.

Thread jacking

Thread jacking (also thread whacking) is to steer off the original topic in an email thread, especially on a mailing list. Thread jacking can also apply to other conversations on the internet, of course, say on message boards, blogs or social networking sites.

Backscatter

Backscatter — or backscatter spam — is a delivery failure report generated by a junk email claiming an innocent third party's email address as the sender.

Spyware

Spyware is software that aids in gathering information about a person or organization without their knowledge and that may send such information to another entity without the consumer's consent, or that asserts control over a computer without the consumer's knowledge. "Spyware" is mostly classified into four types: *system monitors*, *trojans*, *adware*, and *tracking cookies*. Spyware is mostly used for the purposes such as; tracking and storing internet users' movements on the web; serving up pop-up ads to internet users.

Email Client

A program used to read and send email messages. As opposed to the email server, which transports mail, an email client is what the user interacts with. Typical email clients are Outlook Express or Eudora.

Netiquette

It is essential for all users on the internet to recognize that they are responsible for their own individual actions while using the net. Netiquette is simply the use of common courtesy and polite behavior while using the net.

16.7 SEARCH ENGINE

Search engines are *the special websites that provide facility to Internet users to search information on the Internet*. A lot of information is available on the Internet in different websites. There are billions of websites on the Internet. The Internet users only browse the important website addresses. The other website addresses can be searched through search engines. The search engines keep the record of website addresses along with important words for description of each web page.

For example, if you want to get information about the “*History of Internet*”, give these words to any search engine. The search engine will search the given information and will provide a list of links of websites along with brief description about each website. Click one of the links of websites after reading the description. The commonly used search engines and their URL addresses are:

GOOGLE	http://www.google.com
YAHOO	http://www.yahoo.com
ALTA VISTA	http://www.altavista.com
ASK	http://www.ask.com
EXCITE	http://www.excite.com
INFOSEEK	http://www.infoseek.com
LYCOS	http://www.lycos.com
MSN	http://www.msn.com
HOTBOT	http://www.hotbot.com

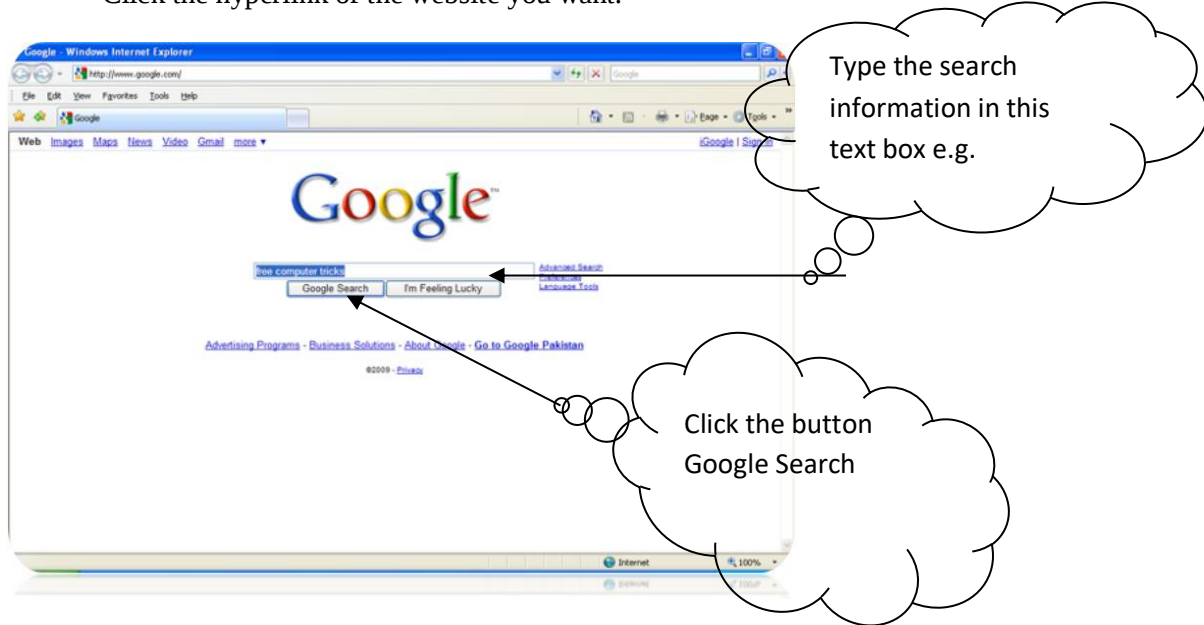
It must be noted that you can create your own website and register your page with any search engine. Your page can be searched by any Internet user through search engine.

Searching Information using Search Engine

To search information on the Internet, follow these steps.

- Open any search engine.
- Type the information to search in the "Search" or "Find" text box of search engine page.
- Click the Search or Find or Seek button of search engine page. The search engine sends the typed information to its database. After a few seconds result is displayed in the browser window. There may be about 100 or more websites that match your given topic or query.

- Click the hyperlink of the website you want.



16.8 WEB BROWSERS

A **web browser or browser** is a software application for retrieving, presenting, and traversing information resources on the World Wide Web.

An *information resource* is identified by a *Uniform Resource Identifier* (URI) and may be a web page, image, video, or other piece of content.

Hyperlinks present in resources enable users easily to navigate their browsers to related resources. A web browser can also be defined as an application software or program designed to enable users to access, retrieve and view documents and other resources on the Internet.

Although browsers are primarily intended to access the World Wide Web, they can also be used to access information provided by web servers in private networks or files in file systems.

The major web browsers are: *Mozilla Firefox*, *Google Chrome*, *Netscape Navigator*, *Internet Explorer*, *Opera*, and *Safari*.

The primary purpose of a web browser is to bring information resources to the user. This process begins when the user inputs a Uniform Resource Locator (URL), for example *http://www.psc.org/*, into the browser.

The prefix of the URL, the Uniform Resource Identifier or URI, determines how the URL will be interpreted.

The most commonly used kind of URI starts with *http:* and identifies a resource to be retrieved over the Hypertext Transfer Protocol (HTTP). Many browsers also support a variety of other prefixes, such as *https:* for HTTPS, *ftp:* for the File Transfer Protocol, and *file:* for local files.

Prefixes that the web browser cannot directly handle are often handed off to another application entirely.

For example, *mailto:* URIs is usually passed to the user's default e-mail application, and *news:* URIs is passed to the user's default newsgroup reader.

16.9 CLOUD COMPUTING

Cloud computing is a general term used for anything that involves delivering hosted services over the Internet e.g. Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS).

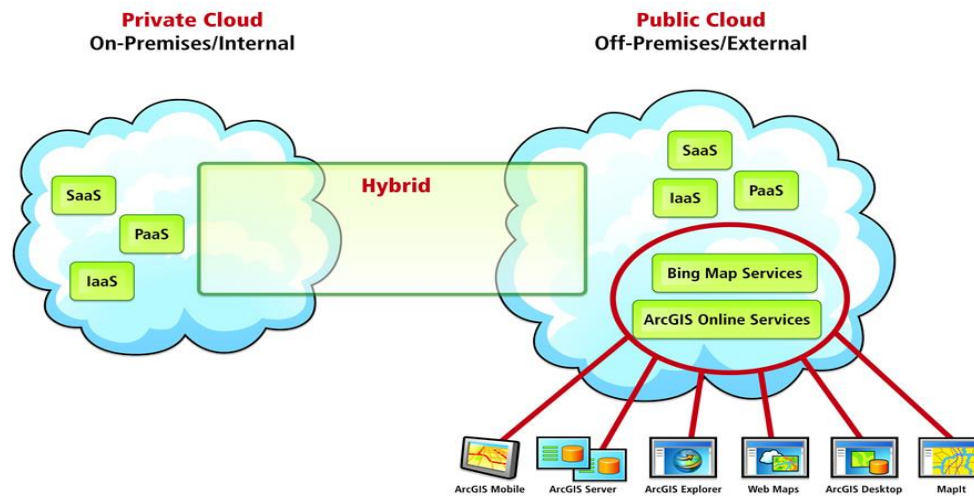
Or

Cloud computing is a term given to out sourced computer hardware, software and platforms over the internet.

Cloud computing is a type of computing that relies on *sharing computing resources* rather than having local servers or personal devices to handle applications.

In cloud computing, the word cloud (also "the cloud") is used as a metaphor for "*the Internet*," so the phrase *cloud computing* means "a type of Internet-based computing," where different services -- such as servers, storage and applications -- are delivered to an organization's computers and devices through the Internet.

Types of Cloud Computing



With cloud computing technology, large pools of resources can be connected through private or public networks.

This technology simplifies infrastructure planning and provides dynamically scalable infrastructure for cloud based applications, data, and file storage. Businesses can choose to deploy applications on Public, Private, Hybrid clouds or the newer Community Cloud.

Public

Public clouds are made available to the general public by a service provider who hosts the cloud infrastructure. Generally, public cloud providers like Amazon AWS, Microsoft and Google own and operate the infrastructure and offer access over the Internet. With this model, customers have no visibility or control over where the infrastructure is located. It is important to note that all customers on public clouds share the same infrastructure pool with limited configuration, security protections and availability variances.

Public Cloud customers benefit from economies of scale, because infrastructure costs are spread across all users, allowing each individual client to operate on a low-cost, "pay-as-you-go" model. Another advantage of public cloud infrastructures is that they are typically larger in scale than an in-house enterprise cloud, which provides clients with seamless, on-demand scalability. These clouds offer the greatest level of efficiency in shared resources; however, they are also more vulnerable than private clouds.

Private

Private cloud is cloud infrastructure dedicated to a particular organization. Private clouds allow businesses to host applications in the cloud, while addressing concerns regarding data security and control, which is often lacking in a public cloud environment. It is not shared with other organizations, whether managed internally or by a third-party, and it can be hosted internally or externally.

There are two variations of private clouds:

- **On-Premise Private Cloud:** This type of cloud is hosted within an organization's own facility. A businesses IT department would incur the capital and operational costs for the physical resources with this model. On-Premise Private Clouds are best used for applications that require complete control and configurability of the infrastructure and security.
- **Externally Hosted Private Cloud:** Externally hosted private clouds are also exclusively used by one organization, but are hosted by a third party specializing in cloud infrastructure. The service provider facilitates an exclusive cloud environment with full guarantee of privacy. This format is recommended for organizations that prefer not to use a public cloud infrastructure due to the risks associated with the sharing of physical resources.

Hybrid

Hybrid Clouds are a composition of two or more clouds (private, community or public) that remain unique entities but are bound together offering the advantages of multiple deployment models. In a hybrid cloud, you can leverage third party cloud providers in either a full or partial manner; increasing the flexibility of computing. Augmenting a traditional private cloud with the resources of a public cloud can be used to manage any unexpected surges in workload.

Hybrid cloud architecture requires both on-premise resources and off-site server based cloud infrastructure. By spreading things out over a hybrid cloud, you keep each aspect of your business in the most efficient environment possible. The downside is that you have to keep track of multiple cloud security platforms and ensure that all aspects of your business can communicate with each other.

Here are a couple of situations where a hybrid environment is best:

- Your company wants to use a SaaS application but is concerned about security.
- Your company offers services that are tailored for different vertical markets. You can use a public cloud to interact with the clients but keep their data secured within a private cloud.
- You can provide public cloud to your customers while using a private cloud for internal IT.

Community

A community cloud is a multi-tenant cloud service model that is shared among several or organizations and that is governed, managed and secured commonly by all the participating organizations or a third party managed service provider.

Community clouds are a hybrid form of private clouds built and operated specifically for a targeted group. These communities have similar cloud requirements and their ultimate goal is to work together to achieve their business objectives. The goal of community clouds is to have participating organizations realize the benefits of a public cloud with the added level of privacy, security, and policy compliance usually associated with a private cloud. Community clouds can be either on-premise or off-premise.

Here are a couple of situations where a community cloud environment is best:

- Government organizations within a state that need to share resources
- A private HIPAA compliant cloud for a group of hospitals or clinics
- Telco community cloud for telco DR to meet specific FCC regulations

Advantages of cloud computing

- Cloud computing is probably the most cost effective method to use, maintain and upgrade

information systems.

- Almost unlimited storage for information in the cloud gives you unlimited storage capacity.
- Because all the data is stored in the cloud, backing it up and restoring the same is relatively much easier than storing the same on a physical device.
- Software integration is usually something that occurs automatically so you do not need to take additional efforts to customize your applications.
- Once you register yourself in the cloud, you can access the information from anywhere where there is an internet connection.
- Cloud computing is easily scalable so companies can add or subtract resources based on their needs.

Disadvantages of cloud computing

- Storing information on the cloud can render the data and information vulnerable to external hack attacks and threats.
- Long term dependency on the cloud host for maintenance of your information is another short coming of cloud computing.
- Dependency on the third party to ensure confidentiality of data and information is another limitation of cloud computing.
- There is less control that comes when handing over all your data and information to the cloud providers.

16.10 COMMUNICATION SYSTEMS

Personal and public communications

Key terms—*convergence, teleconferencing, videoconferencing, telecommuting, digital television, push–pull technologies*

Convergence

Convergence is the approach toward a definite value, a definite point, a common view or opinion, or toward a fixed or equilibrium state

Teleconferencing

A teleconference is live exchange and mass articulation of information among several persons and machines remote from one another but linked by a telecommunications system.

Videoconferencing

Face-to-face communication over long distances using video and computer technology. A videoconference or video conference (also known as a video teleconference) is a set of interactive telecommunication technologies which allow two or more locations to interact via two-way video and audio transmissions simultaneously.

Video Conferencing is the conducting a conference between two or more participants at different sites by using computer networks to transmit audio and video data. For example, a *point-to-point* (two-person) video conferencing system works much like a video telephone.

Each participant has a video camera, microphone, and speakers mounted on his or her computer. As the two participants speak to one another, their voices are carried over the network and delivered to the other's speakers, and whatever images appear in front of the video camera appear in a window on the other participant's monitor.

Multipoint videoconferencing allows three or more participants to sit in a virtual conference room and communicate as if they were sitting right next to each other.

The following five elements are common to all video conferencing endpoints:

- **Camera:** The camera captures live images to send across the network.
- **Visual Display:** It displays the images of the people taking part in the videoconference.
- **Audio System:** It includes both microphones to capture audio from the endpoint and loudspeakers to play back the audio received from other endpoints across the network connection.
- **Compression:** Videos are very bandwidth-intensive and they take a long time to load. Therefore, video systems include technologies, often referred to as codes, to compress and decompress video and audio data, allowing transmission across a network connection in near-real time.
- **User Interface and Control System:** The user interface allows the users to control interactions for example, placing calls, storing and locating numbers, and adjust environment settings such as volume. The control system handles the underlying communication that takes place between endpoints.

Advantages of Videoconferencing

- **No Time Constraint:** Video conferencing can be conducted at any time of the day. Time differences between countries do not matter when people use this method of communication because they do not actually need to travel to attend meetings.

- **Saves Time and Money**

Transaction of any business requires frequent travel, to facilitate its growth and diversification. That translates to travel and associated costs like hotel accommodation and food expenses. A video conference will keep executives in the office, rather than sending them halfway across the country for conducting business. As one can conduct transactions without traveling, it also reduces the time spent in doing so.

- **Sharing Information is Easy**

This technology enables improvisation of operations and services of remote outlets. As it can also be used to transmit files and documents, it is possible to provide real-time information that can help in solving problems. Also, decisions can be made in the least possible time. The ability to share, coordinate and evaluate digital data from anywhere in the world allows people to conduct simultaneous communication and collaboration on time-sensitive projects.

- **Useful for Medical Professionals**

Video conferencing makes it easier to access experts in a medical environment. Doctors, scientists, and researchers can bring together their findings and studies, and accelerate the process of providing timely assistance. This type of collaboration can not only help save lives, but can also help many people who can't travel long distance to access health care.

- **Facilitates Long-distance Programs**

Educational institutions, mainly long-distance education programs and instructional courses, have reaped enormous benefits from video conferencing. Professionals and students are able to access lectures, study material, group discussions, and even one-to-one talk with the instructor. It has taken education to far-flung corners of the world.

Disadvantages of Videoconferencing

- **Technical Problems**

The major disadvantages are the technical difficulties associated with smooth transmissions that could result from software, hardware or network failure. Remote connections are sometimes known to be hampered by environmental changes. On some occasions, the absence of technical support personnel creates difficulty for participants who are unfamiliar with the videoconferencing technological concepts.

- **Lack of Personal Interaction**

Another major drawback is the lack of personal interaction that sets the tone for many business meetings in highly cultural societies. A handshake and an eye contact are essential aspects of many business meetings. Some meetings require a personal touch to be successful.

- **High Cost of Setup**

Setting up video conferencing in an office can be a bit expensive for small-sized companies. Simple features can fit into the budget, but if advanced features are required, and then a substantial amount of expenditure must be done.

Video conferencing advantages definitely outweigh its disadvantages. It can help stimulate better brainstorming, knowledge, fact and information sharing and gathering. The possibilities for different kinds of communication, for a better life seem to be endless due to this technology.

Telecommuting

This is a long-distance electronic communication in a variety of forms.

Telecommuting or **remote work** or **telework** is a work arrangement in which the employee works outside the office, often working from home or at a location close to home (including coffee shops, libraries, and various other locations).

Rather than travelling to the office, the employer “travels” via telecommunication links, keeping in touch with coworkers and employers via telephone and email.

Advantages of Telecommuting:

No Commuting

Depending on your current commute, this can save you anywhere from minutes to hours every day, which you can spend doing things you enjoy, like sleeping, spending more time with your kids or spouse, going to the dog park, or any other activity you’d like to have more time for.

Increased Independence

Working from home puts the onus on you to complete your work without constant reminders, which some people absolutely love. No office politics, no boss breathing down your neck, no distracting coworkers — telecommuting can be glorious. And yet, it’s very easy to get distracted by things in your home — television, laundry, a comfy bed for napping — some days these seem like a much better alternative to actually doing work. Having a high degree of self-control and self-discipline is essential to being a productive telecommuter.

Increased Savings

Most people who work from home have very little need for professional clothing, which not having to buy can save lots of money every year. Other things you’ll find less need for: gas or public transit passes for commuting, lunches out, dry cleaning, and child care (depending on your situation). And most people who work from home are able to save on their taxes each year because of the tax-deductible expenses associated with working from home.

More Flexibility

Again, this depends on the type of job you’ll have at home, but many work-from-home jobs allow for a flexible schedule, so if you need to go grocery shopping or do a load of laundry in the middle of the day, it’s simple: you can. Or, if you’re a morning person or a night owl, you can adjust your work schedule accordingly.

Fewer sick days

Working in a traditional office exposes you to many people’s germs, but if you work from home, you have less exposure to people, and therefore, to their germs. Also, if you’re feeling under the weather, it’s

much easier to pamper yourself and still get some work done when you're at home, meaning you'll probably take fewer sick days.

Disadvantages of Telecommuting

Decreased human interaction

If you're the sort of person who thrives on interactions with other people, working from home can feel isolating. It's possible to remedy this feeling with e-mail, phone calls, instant messaging, and video conferencing, but it's no substitute for face-to-face interaction. Some telecommuters find that working from a coffee shop or library satisfies their people fix, but others prefer the office environment to solitude. A coworking space might solve this problem by allowing you to telecommute AND work from an office setting.

Blurring Work and Personal Life

When you work from home, you can't always shut out your personal life while you're working, or turn off your work life while you're "off the clock." Having a separate work space from the rest of your home can help, but some people find it difficult to stop working when they know it's only a few feet away.

Difficulty Demonstrating Workload

If you're a telecommuter working for a company with a traditional office, your office-bound coworkers might perceive you as doing less work simply because you're at home. It's important to showcase your workload to demonstrate to managers and coworkers that you are accomplishing as much, if not more, as you would if you were in a cubicle down the hall.

Digital television

Digital television (DTV) is the sending and receiving of moving images and sound by discrete signals, in contrast to the analog signals used by analog TV.

Digital television (DTV) is television broadcasting in which the pictures are transmitted as digital signals that are decoded by a device in or attached to the receiving television set.

Advantages

- The digital broadcast offers better quality of picture and sound. Furthermore, some TV stations will be able to broadcast in high-definition.
- The digital broadcast consumes less bandwidth than the analog one. This will free space for more wireless networks, which on the other hand will improve the communication services.
- With the digital television, you will have access to more channels. You had probably noticed that with analog TV you have access to just a couple of TV channels, but with the new digital technology the TV stations will have the ability to broadcast more channels simultaneously.
- Offers many more channels compared to terrestrial analogue
- Higher quality images, especially HD television
- Can display high quality pictures from Blu-Ray and games consoles plugged into the tv.
- Higher quality sound
- Many interactive services are available, especially if the television has a network and broadband connection.

Disadvantages

- The biggest disadvantage of the digital TV is the fact that you will need special equipment. For the old analog broadcast, the only thing that you needed was an antenna, but for the new digital broadcast you will need digital converter box.
- The digital broadcast is the loss of signals. With the old analog broadcast, you are probably used to bad picture when the weather is bad, but with the new digital one you will lose all your channels entirely.

- Can be awkward for a non-technical person to set up a broadband connection
- With so many channels to fill, the quality of the programs may be lower or they have endless repeats.
- Poorly designed 'electronic program guides' (EPG) can be really awkward to use.

Push technology

This is the technology in which information is delivered automatically to a client computer. The user subscribes to a service and the server delivers that information periodically and unobtrusively. Contrast with pull technology.

Pull technology

This is the Technology in which browsers on client computers pull information from server machines. The browser needs to initiate a request before any information is delivered.

Mobile phone and associated services and uses

- Digital entertainment versus live entertainment
- Contents of digital entertainment, for example, violence, pornography and realism
- Features of telecommuting, for example, environmental aspects, flexibility, productivity, business and social relationships
- Face-to-face communications versus communications via technology
- Minimum requirements to enable realistic teleconferencing and videoconferencing
- Undetected intrusions into IT systems, for example, phone tapping
- Personal mobile devices, for example, PDA, laptop
- Emerging technologies as the result of convergence of computers and communications technology
- Public information systems, for example, traffic control, security camera systems, public transfer information systems.

EXERCISE

1. Write the following in full:
 - a. ISP
 - b. HTTP
 - c. POP
 - d. TCP/IP
 - e. IMAP
 - f. FTP
 - g. SLIP
 - h. HTML
 - i. WAP
 - j. IP
 - k. URL
 - l. Email
 - m. Surfing
 - n. Bandwidth
 - o. Network Protocol
 - p. Local Search Engine

- q. Computer Network
 - r. Attachment
 - s. Extranet
 - t. Intranet
 - u. Server
2. Define the following:
- a. Network Administrator
 - b. Packet
 - c. IP Address
 - d. Octet
 - e. Network Adapter/Network Card/NIC
 - f. Repeater
 - g. Gateway
 - h. Firewall
 - i. Router
 - j. Switch