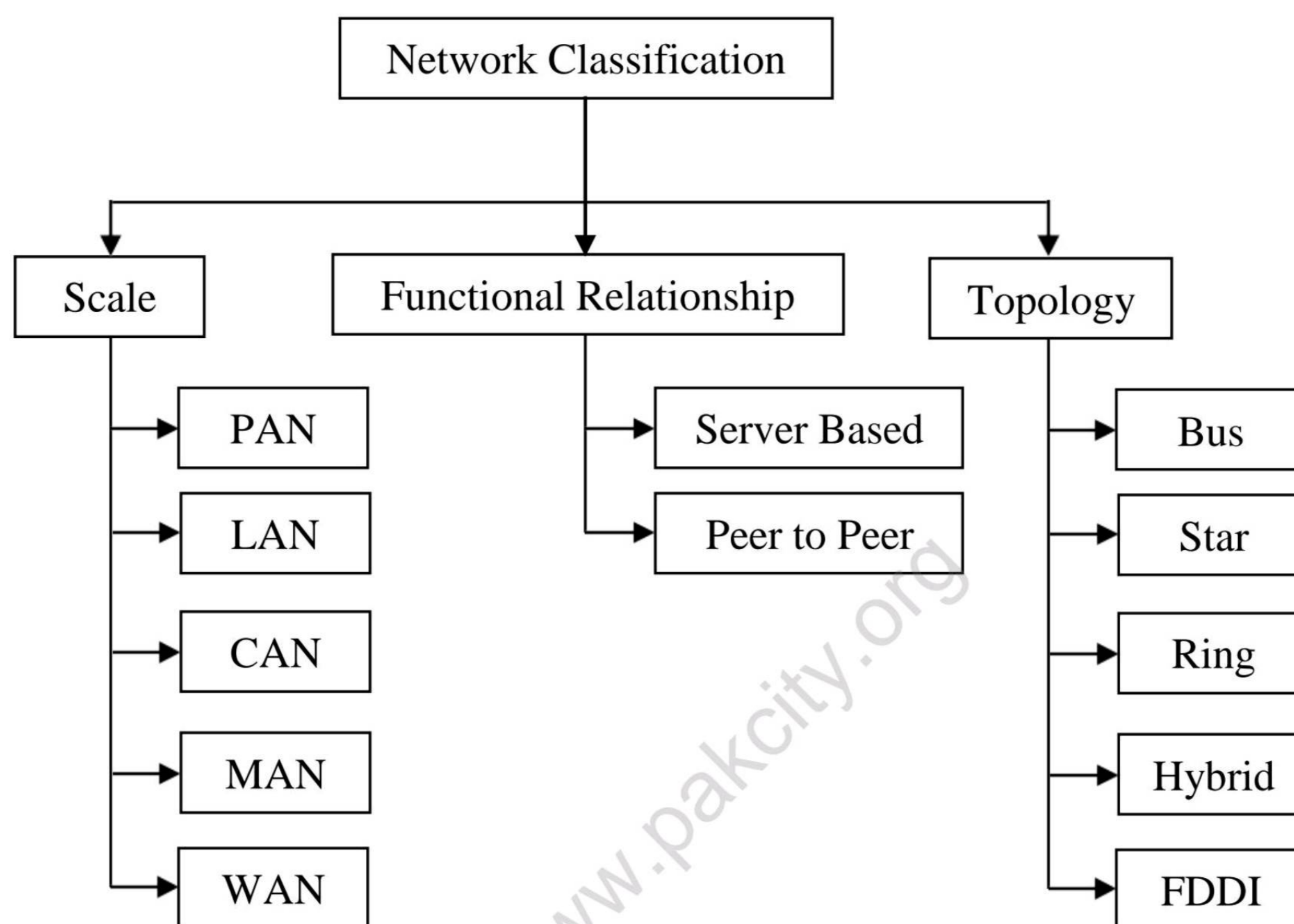# CHAPTER # 02

INFORMATION NETWORKS   pakcity.org

COMPUTER NETWORKS:

A computer network is a group of interconnected computers. Telephones, or other communication devices that can communicate with one another and share applications and data. Networks may be classified according to a wide variety of characteristics.

```
                        Network Classification

        Scale           Functional Relationship        Topology

       → PAN              → Server Based              → Bus
       → LAN              → Peer to Peer              → Star
       → CAN                                          → Ring
       → MAN                                          → Hybrid
       → WAN                                          → FDDI
```

TYPES OF NETWORKS (ON THE BASIS OF SCALE)

Personal Area Network:

A personal area network (PAN) is a computer network used for communication among computer devices close to one person. Some examples of devices that are used in a PAN are printers, fax machines, telephones, PDAs or scanners. The reach of a PAN is typically within about 20 – 30 feet. Personal area networks may be wired with computer buses such as USB. A wireless personal area networks (WPAN) can also be made possible with network technologies such as IrDA and Bluetooth.

LOCAL AREA NETWORK:

Local area network (LAN) is a network covering a small geographic area, like a home, office, or building. Current LANs are most likely to be based on Ethernet technology. For example, a library may have a wired or wireless LAN for users to interconnect local derives (e.g., printers and servers) and to connect to the internet.

CAMPUS AREA NETWORK:

A network that connects two or more LANs but that is limited to a specific and contiguous geographical area such as a college campus, industrial complex, or a military base. A CAN may be considered a type of MAN (metropolitan area network), but is generally limited to an area that is smaller than a typical MAN. This term is most often used to discuss the implementation of networks for a contiguous area.

METROPOLITAN AREA NETWORK:

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

WIDE AREA NETWORK:

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

TYPES OF NETWORKS:
(ON THE BASIS OF FUNCTIONAL RELATIONSHIP)
Server Based Systems:

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TYPES OF NETWORKS:
(ON THE BASIS OF FUNCTIONAL RELATIONSHIP)
SERVER BASED SYSTEMS

Server-based networks are defined by the presence of server on a network that provide security and administration of the network. In order to operate, server-based networks have clients that rely on the services the server provides, such as file storage and printing client computers are generally less powerful than pear or server computers.

Advantages:
- ★ Strong central security
- ★ Ability to share expensive equipment, such as laser printers.
- ★ Freeing of users from the task of managing the sharing of recourses.
- ★ Easy manageability of a large member of users.
- ★ Central organization, which keeps data from gently last among computers.

Disadvantages:
- ★ Expensive dedicated hardware.
- ★ Expensive network operating system software and client licenses.
- ★ A dedicated network administrator (usually required).

PEER-TO-PEER:

Peer networks are defined by lack of central control over the network. There are no servers in peer network, users simply share disk space and resources, such as printers and faxes, as they see fit.

Peer networks are organized into workgroups. Workgroup have very little security control. These is no central login process.

Access to individual resources can be controlled if the users who shared the resource require a password to access it. Because there is no central security trust, we will have to know the individual password for each secured shared resource you wish to access. This can be quite inconvenient.

Peer is also not optimized to share resources. Peer also generally has licensing limitations that prevent more than a small number of users from simultaneously accessing resources.

Advantages:

Peer computers have many advantages, especially for small business that cannot afford to invest in expensive server hardware and software.
- ★ Easy setup
- ★ No extra investment in server hardware or software is required.
- ★ No reliance on other computer for their operation
- ★ Lower cost for small networks.

Disadvantages:
- ★ Additional load on computers because of resource sharing.
- ★ Inability of peers to handle as many networks connections as servers.
- ★ Lack of central organization, which can make data hard to find.
- ★ No central point of storage for files archiving.
- ★ Requirement that users administer their own computers.
- ★ Weak and intrusive security.

TYPES OF NETWORKS (ON THE BASIS OF TOPOLOGY)

The physical layout or shape of the network is called topology Networks can be laid into the five basic topologies:
- ★ Star
- ★ Ring
- ★ Bus
- ★ Hybrid
- ★ FDDI

Star Networks:

In star network, all microcomputers and other communication devices are connected to the central hub, usually via UTP (unshielded twisted pair). Electronic messages are sent through the central hub to their destinations at rates of 1 – 100 Mbps. The central hub monitors the flow of traffic.

Example:

A PBX system is the example of star network.

Advantage:

★ If the connection is broken between any communications device and the hub, the rest of the devices will continue operating.
★ New terminals can be added to a network easily.
★ There is no chance of data collision because central server prevents collisions between messages.
★ If a connection is broken between any communications device and the central server, the rest of the devices on the network will continue operating.
★ Transmission delays between two terminals of between server and terminal do not increase by adding new nodes to the network because any two devices may be connected via two links only.

Disadvantage:

★ Hub is the central point of failure.
★ The network crucially depends on the central server. If the central server fails, the entire network will stop.
★ Star topology is expensive because a separate cable is required for connecting each computer with the central server.

Ring Network:

In ring network, all microcomputers and other communication devices are connected in a continuous loop. Electronic message are passed around the ring in one direction, with each node serving as a repeater, until they reach the right destination. Rings generally are UTP, STP, or fiber optic cable with transmission speed of 16 Mbps.
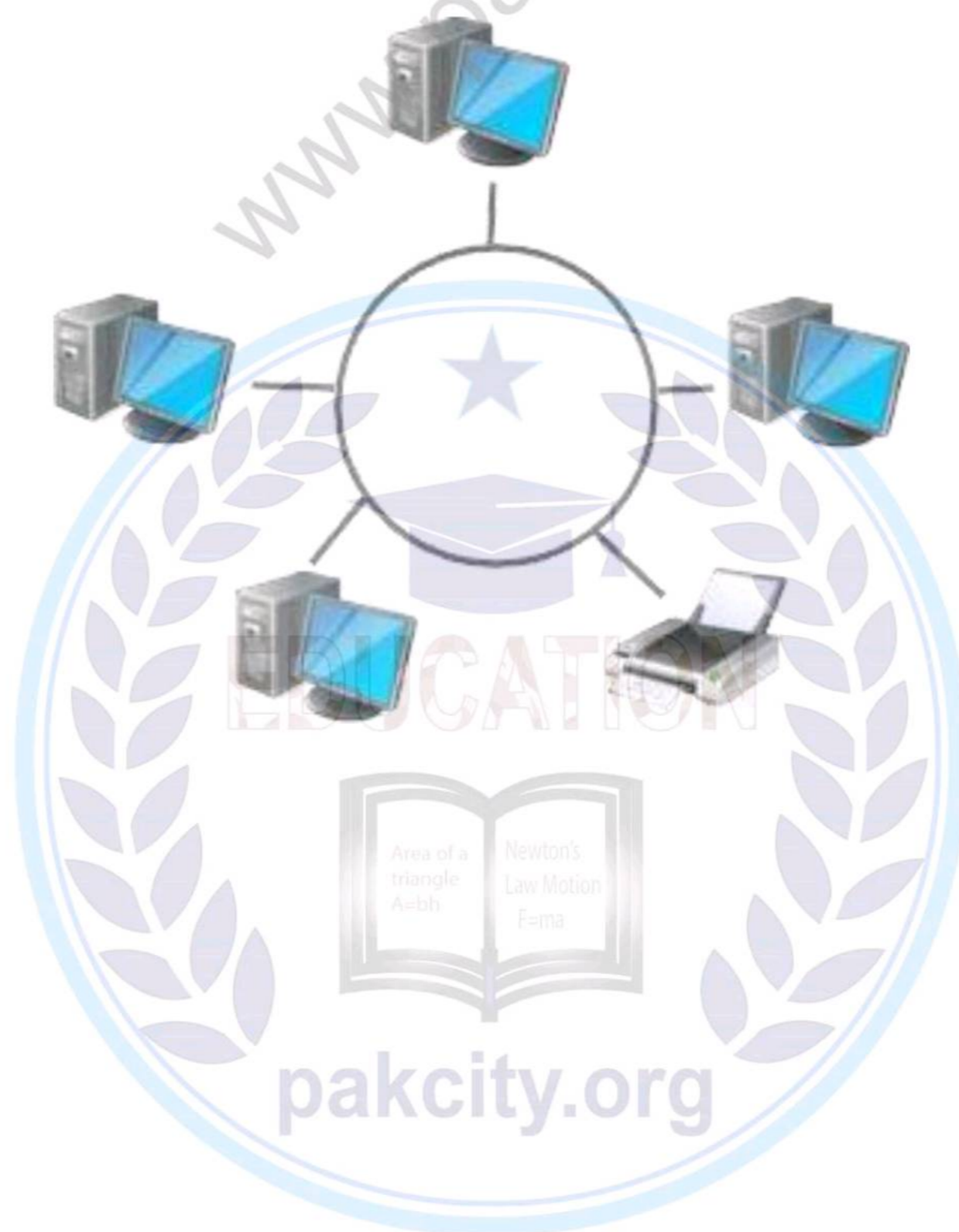
Example:

The example of ring network is IBM"s Token Ring Network, in which a bit pattern (Called the „toke") determines which user on the network can send information.
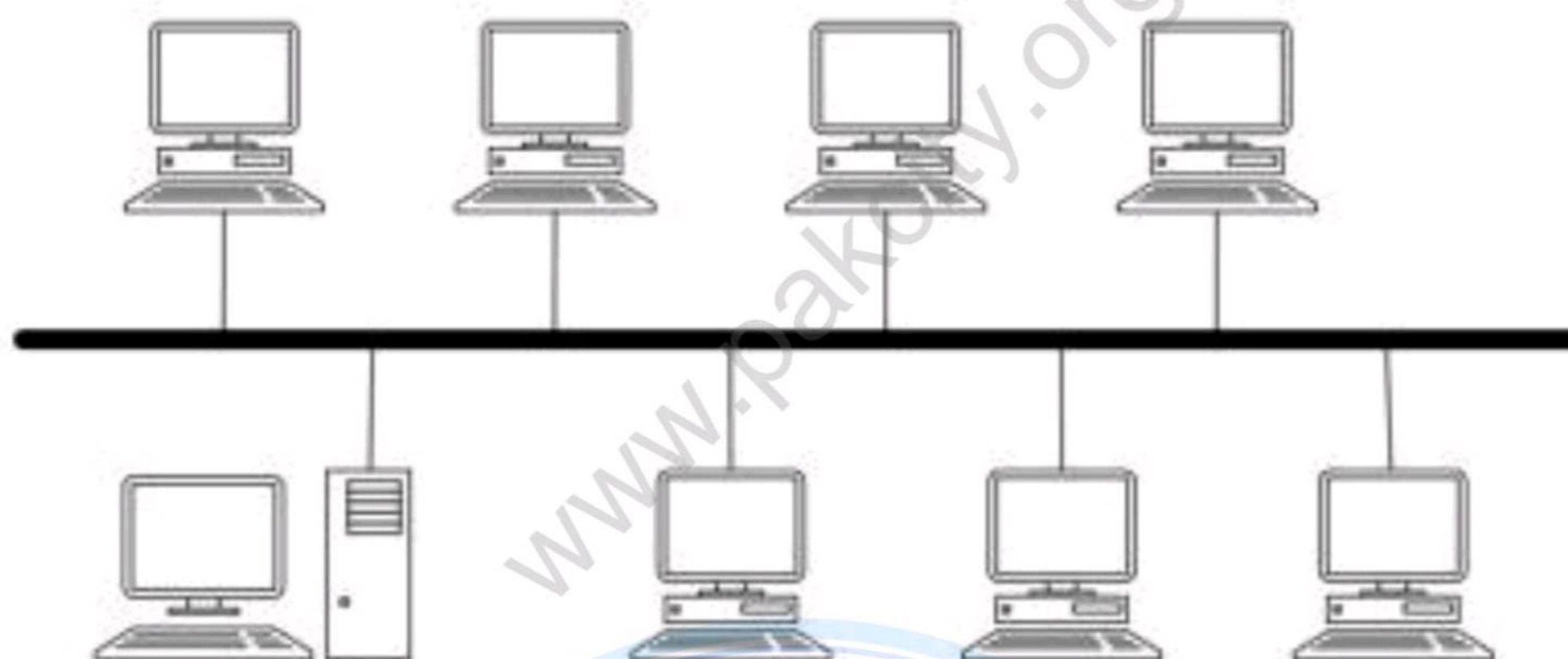
Advantage:
★ Message flow in only direction so there is no danger of collision.
★ In a ring network messages flow in only one direction. Thus, there is no danger of collision.
★ It is more reliable than a star network because communication is not dependent on a single host computer.

Disadvantage:
★ The current speed limit and the relatively high cost is its limitation.
★ If the ring is broken, the entire network stops working.
★ It is difficult to troubleshoot the ring network.
★ New computer or terminal cannot be added to network easily.
★ Communication delay is directly proportional to the number of computers in the network.

Bus Network:

In bus network, all microcomputers and other communication devices are connected to a common cable called the bus, using co-ax. STP, or UTP. Data transmission is bidirectional at a rate of about 1 – 10 Mbps. Each communication device transmits electronic messages to other devices. If some of those message collide, the device waits and tries to retransmit.

Example:

The example of bus network is Ethernet which has now become common LAN configuration.

Advantage:
★ It is relatively in expensive to install.
★ This type of network is simple and easy to understand.
★ A bus network may be organized as client/server or peer-to-peer network.
★ New terminals can be added to a network easily.
★ If one of the terminals becomes defective it does not affect on other computers of the network.

Disadvantages:
★ If the bus fails, the entire network fails.
★ Extra circuitry and software are needed to avoid collisions between data.
★ If an error arises in a network, it is not easy to detect.
★ If a connection in the bus is broken, the entire network may stop working.

HYBRID NETWORK:

Hybrid networks are combinations of star, bus, and ring networks.

Example:

A small university campus might use a bus network to connect buildings but might use star and ring networks within certain buildings.

FDDI NETWORK:

A newer and higher speed and more costly network is FDDI (Fiber Distributed Data Interface). If is capable of transmitting data at 100 – 200 Mbps. FDDI network uses fiber optic cable with a duple token ring topology. FDDI is used for high tech purposes such as, electronic imaging, high-resolution graphics and digital video.

Advantage:
★ If the primary ring fails, the network can continue operating via the secondary cable ring.

Disadvantage:
★ The disadvantage is its high cost and the fragility of the fiber-optic cable.
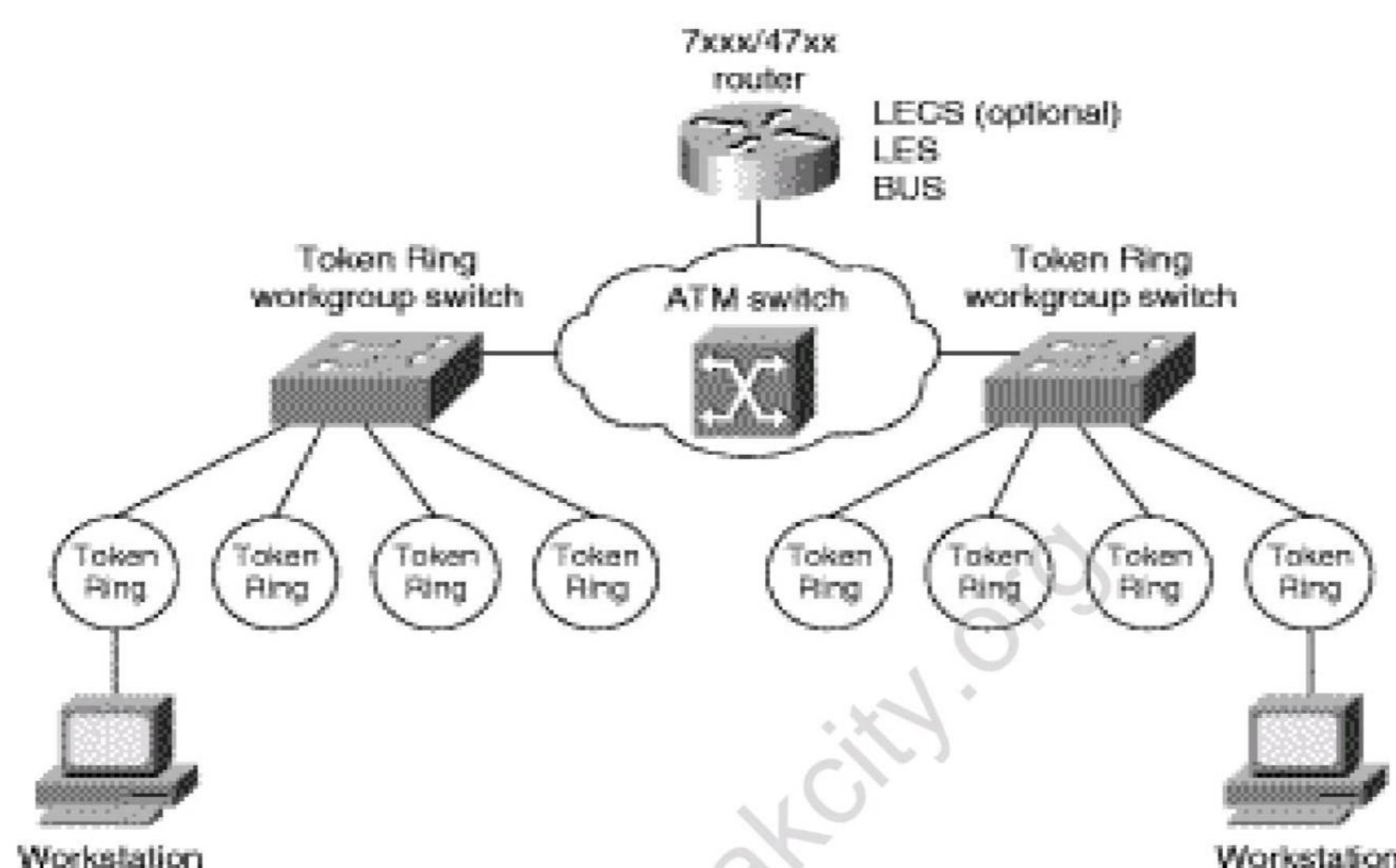
NETWORK CONNECTIVITY DEVICES:

To expand a single network without connecting it to other network, we can usually use one of the following Network connectivity devices:
★ Hubs
★ Active Hubs
★ Passive Hubs
★ Repeaters
★ Bridges

★ HUBS:

All networks (except those using coaxial cable) require a central location to bring media segments together. These central locations are called hubs.

★ PASSIVE HUBS:

A passive hub simply combines the signals of network segments. There is no signal processing or regeneration. Because it does not boost the signal and, in fact, absorbs some of the signal a passive hub reduces by half the maximum cabling distances permitted.

★ ACTIVE HUBS

Active hubs are like passive hubs except that they have electronic components that regenerate or amplify signals.

★ REPEATERS:

All transmission media attenuate (weaken) the electromagnetic waves that travel through them. Attenuation therefore limits the distances any medium can carry data. Adding a device that amplifies

the signal can allow it to travel farther increasing the size of the network.

If we are connecting computers that are more than 100 meters (328 feet) a part using a 10 base Ethernet cable, we will need a device that amplifies signals to ensure data transmission. Devices that amplify signals in this way are called repeaters.

★ BRIDGES:

Bridges connect networks segments. The use of a bridge increases the maximum possible size of the network. Unlike a repeater that simply passes on all the signals it receives, a bridge selectively determines the appropriate segment to which it should pass a signal.

★ INTERNETWORK CONNECTIVITY:

An Internetwork consists of two or more, independent networks that are connected and yet maintain independent identities. An Internetwork may include different types of networks (an Ethernet and a Token Ring network, for example). To connect independent networks, we require internetwork connectivity device. The Internetwork connectivity devices discussed here are:

- ★ Routers
- ★ Gateways I CSUs/DSUs:

Routers:

Routers are devices that connect two or more networks. They consist of a combination of hardware and software. The hardware can be a network Server, a separate computer or a special black box device. The two main pieces of software in a router are the operating system and the routing protocol. Routers operate at the bottom three levels of OSI protocol model. Router is able to view the network as a whole.

Gateways:

Routers can successfully connect networks with protocols that function in similar ways. When the networks that must be connected are using completely different protocols from each other, a more powerful and intelligent device is required. A gateway performs protocol conversion at all seven layers of the OSI model. A gateway entrances to dissimilar networks by tearing down a packet of information from one network and restructuring it for a different network''s protocol.

CSUs/DSUs:

Sometimes, when expanding the network, it is less costly and easier to use existing public networks, such as the public telephone network in our area. Connecting to some of these networks requires the use of CSUs/DSUs (Channel Service Units/Digital Services Usnits). CSUs/DSUs are also useful for shielding our network from both noise and dangerous voltage and currents that can come through the public network.

ADVANTAGES OF NETWORKS:

The following advantages are particularly true for LANs, although they apply to MANs and WANs as well.

SHARING OF PERIPHERAL DEVICES:

Laser printers, disk drives, and scanners are example of peripheral devices-that is, hardware that is connected to a computer. Any newly introduced piece of hardware is often quite expensive, as was the case with color laser printers. To justify their purchase, companies want them to be shared by many users. Usually the best way to do this is to connect the peripheral device to a network serving several computer users.

SHARING OF PROGRAMS AND DATA:

In most organizations, the people use same software and needs access to the same information. It could be expensive for a company to buy one copy of a work processing program for each employee. Rather, the company will usually buy a network version of that will serve many employees.

BETTER COMMUNICATIONS:

One of the greatest features of networks is electronic mail. With e-mail everyone on a network can easily keep other pasted about important information. Thus, the company eliminates the delays encountered with standard interoffice mail delivery or telephone tag.

SECURITY OF INFORMATION:

Before networks became commonplace, an individual employee might be the only one with a particular piece of information, stored in his or her desktop computer. If the employee was dismissed or if a fire or flood demolished the office, no one else in the company might have any knowledge of that information. Today such data would be backed up or duplicated on a networked storage device shared by others.

ACCESS TO DATABASE:

Networks also enable users to tap into numerous databases, whether the private databases of a company or the public databases of online services.

MAJOR FEATURES OF INTERNET:

Since the Internet evolves so rapidly, the features offered over it also change constantly. This section describes five more popular features. These include; electronic mail (e-mail), Usenet, Telnet, File Transfer Protocol (FTP) and Chat.

ADVANTAGES OF INTERNET:

Electronic Mail:

Internet mail service now links people about 200 countries. Futurists predict a universal electronic mail network similar to the phone system.

Chats & Forms:

You can take part in worldwide chats and forums on matters of personal interest – simply browse the network to find topics you wish to discuss.

E – Shopping & E – Business:

It is now possible to search through scores of electronic malls for products. "Intelligent agent" programs will help you find what you want.

Education:

You can find learning materials on virtually every topic on the Internet. Eventually, you will be able to access millions of books online instead of going to library.

Information Retrieval:

Virtually any type of information can be found on the internet – tutorials on various subjects, legal and medical advice – you name it.

On-Demand Movies & Television:

Someday it will be possible to order virtually any movie and television show by computer, choosing your own viewing times.

Customer Support:

Many companies assist customers over the internet. The internet is also widely used to distribute advertising literature about products and to update software.

Access to Remote Computing:

If your own computer is not powerful enough to perform certain types of tasks, you can access larger computers located elsewhere – and their software too.

Bulk File Transfer:

Products such as electronic news papers and magazines – as well as software and music – are distributed over the internet, saving cost of print, media, disks and mailing.

Social Video Gaming:

Games in which several people participate are now available over the internet. Participation in video games via internet links will increase in future.

News & Weather:

Information about news, events and weather happening all over the globe are updated regularly on the internet. You can even access satellite data.

Conferencing:

Futurists predict that a picture – a phoning device that enables people to see each other as they speak – will someday be a standard feature on the internet.

Electronic Mail:

The internet is now the world"s largest electronic mail system. Anyone with an e-mail account can send message to other users of the internet and to may networks connected to the program files to messages.

All internet electronic mail address has two parts, the user name and the domain name.

Advantages of E-mail:

Compared to the postal service electronic mail has many advantages:
★ It is very fast. It delivers you messages and data in few seconds.
★ It is very easy to receive, respond and send messages and data.
★ It is available at every time.
★ It is a great gun to find friends all over the world.
★ Electronic mail access is available from different services which are free.
★ It is really flexible. You can send a message to all the persons you like.

Disadvantages of E-mail:

Following are some disadvantages of e-mail:
★ It is not commonly available.
★ It has created an information overload. People are swamped by junk/spam mails and finding what is relevant and need to read from the hundreds of mails.
★ It is possible that any of the e-mail contains virus, which may affect your computer system.
★ Any e-mail send to wrong address cannot be recalled back.
★ It is not completely private or confidential due to hacking problem.
★ As e-mail is free, so someone may send e-mail for trouble so that you may feel uneasy to deal with.

Usenet:

Usenet is a collection of more than 30,000 newsgroups, or discussion groups, on every

conceivable subject. For example, some newsgroups are self-help groups for victims of cancer or other abuse, and other give the latest in gossip about show business personalities.

Telnet:

Telnet is the service of the internet that allows you to access remote computers outside your area. Many computers on the internet are set up to allow Telnet access. Some require login names and passwords, but many do not have any restriction.

File Transfer Protocol (FTP)

Another common use of the internet is to download computer programs and files by means of File Transfer Protocol (FTP), one of the internet"s many standards.

Chat:

Chat refers to a facility that enables people to engage in interacting conversations over the internet. The oldest but still most common type of chat is internet relay chat.

Other Types of Chat:

Various other, more sophisticated types of chat exist, Several of these are discussed below.

3-D Virtual Chat:

This type of chat is a graphical extension of IRC. It enables you to take the persona of a 3-D character who appears on the screen. In the chat, you mingle with other people having their own onscreen personas.
To use this feature, you need 3-D chat software, a spaedy computer, and a fast internet connection e.g. Skype.

Instant Messaging:

Instant messaging is a cross between the IRC chat room and e-mail. A buddy list contains the names of your friends and associates; a small windows pops up on your screen from your ISP telling you when they are online. At that time, you can invoke instant messaging by sending any of then a message that immediately appears on their screen. The receiver can respond in kind sending an instant message back to you e.g. MSN Messenger.

World Wide Web (WWW)

The World Wide Web (WWW) is a worldwide hypermedia system. When you read a Web document (Web site), you see underlined words. Each underlined word refers to a computer resources program, graphic or document. When you select, or click the world, the Web software connects you to that computer. You don"t have to know exactly where the resources are located – you just click.

The internet and the World Wide Web are redefining the globe community. Because have found a new internet and the World Wide are redefining the globe community. Business have found a new venue for two-way communication with customers in the Web site. Not only can business advertise, but they also can provide much more information.

Addresses for World Wide Pages:

Web pages and links to information at Gopher, FTP and other sites are most commonly located on the internet through Uniform Resource Locators, or URLs. Every Web page has its own URL (sometimes pronounced "earl"). If you know a page"s URL, type it in the specified area of your Web browser"s screen and the page will be displayed.
Web-site URL"s often contain the three letters www preceded by the protocol identifier http:// for hypertext transfer protocol). For instance, the Web search site, respectively, have the following URLs.

pakcity.org

WEB TERMINOLOGY:

The most important parts of the World Wide Web are the elements, such as servers, pages, hot links and more, all of which comprise the bulk of the World Wide Web. The following are some related terms:

Anchor:

A link that takes you to a different part of the same Web page.

Browser:

A software program that requests, interprets, and presents World Wide documents. Frequently used browsers include. Microsoft Internet Explore, Mozilla Firefox, Google Chrome, Netscape etc.

Client:

In addition to being a computer, a client also can be a software program that requests and acquires information from computers that store World Wide Web documents and files. World Wide Web brewers are also known as clients.

Domain Name:

The name given any computer registered on the World Wide Web as an official provider of information and files. Domain names are usually two or more terms separated by periods. Some examples are aol.com or msn.com.

Extranet:

An extension of an internal network (intranet) to connected not only internal personnel but also selected customer, suppliers and other strategic offices.

Firewall:

A firewall is a system of hardware and software that connects the intranet to external networks, such as the Internet. It blocks unauthorized traffic from entering the intranet and can also prevent unauthorized employees from accessing the intranet.

Frame:

A feature available on the World Wide Web that presents text, links, graphics and other media in separate portions of the browser display. Some sections remain unchanging, whereas others serve as an exhibit of linked documents.

Home Page:

Frequently, the "cover" of a particular Web Site. The home page is the main or first, page displayed for an organization"s or person"s World Wide Web site.

HTML:

Hypertext Markup Language. HTML is the coding language for the World Wide Web that informs browsers how to display a document"s text, links, graphics and other media. This language forms the foundation for all web pages.

Image Map:

A feature available on the World Wide Web that enable you to click various locations in an graphic image to link to different documents.

Intranet:

Intranets are internal corporate networks that use the infrastructure and standards of the Internet and the World Wide Web.

Link:

Short for "hypertext link". A link provides a path that connects you from one part of a World Wide Web document to another part of the same document, a different document, a different documents, or another resource. A link usually appears as a uniquely coloured word that you can click to be transported to another Web page.

Proxy Server:

A proxy server is a server, or remote computer that may exist outside of the organization"s network, and all communications to the organization are routed through it. The proxy server decides which messages or files are safe to pass through to the organization"s network.

Table:

A feature available on the World Wide Web that presents document text, links, graphics and other media in row and column format. Table borders may be visible in some documents but invisible in others.

Web Site:

A collection of World Wide Web documents, usually consisting of a home page and several related pages. You might think of a Web site as an interactive electronic book.

Webmaster:

The individual responsible for maintaining and updating the content of a World Wide Web document. Webmasters are the creative forces behind the World Wide Web.

ABUSES OF INTERNET:

Below are common internet services, common abuses and protections:

E-mail:

Commonly e-mail abuses are:
★ Sending threatening or harassing e-mail.
★ Sending junk e-mail.

Common e-mail mistakes are:
★ Poor composition and spelling mistakes.
★ Writing something in e-mail that you shouldn"t.
★ Sending anonymous jokes and pranks.

News Groups:

News groups are world wide computer bulleting boards.

Common news groups abuse are:
★ Flaming
★ Off topic messages

Common news groups mistakes are:
★ Getting drawn in to a flame war.
★ Posting off-topic messages.

Web Browsing:

Web browsing is generally safe, however you should use your web brower"s security features. Children should use browsers that can filter the undesirable web sites. Even if use sites. Even if you filtering software children should always be supervised while using the internet.

Common web abuses are:
★ Contains incorrect information or material about Muslims and Islam.

★ Posting erroneous information.

Common web mistake are:

★ Believing everything you see.

Chat Programs:

Common chat abuses are:

★ Rogues that harass and/or try to take over your channel.

★ Adults trying to „Pick up‟ children.

Common chat mistake are:

★ Giving a rouge "operator" privileges.

★ Giving personal information to someone you don‟t know.

CONCLUSION:

The internet is new for most people. Just as with the use of other new technologies telephone, automobile etc.) some people will abuse or use the new technology to harm others. You should be aware of the risks, use the Internet with care, and care, and stay abreast of the precautions you need to take.