CHAPTER

FIVE

NETWORK & LIBRARY NETWORK
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Network & Library Network

5.0 NETWORK OF NETWORKS

The Internet is the world’s largest computer network i.e. “Network of networks”. It is an outgrowth of ARPANET (Advanced Research Project Agency) started by the Department of Defense in the USA in late 60’s. The term Internet first appeared around the 1980’s and it was only in 1991 that the Internet was first opened for commercial users. Today, the Internet connects around 20 million users worldwide and is growing at an accelerated rate by more than a million users each month. It joins over 10,000 networks and over 1000 computers join the Internet each day. It was started by the National Science Foundation of the United States. ISOC or the Internet Society is the only group that controls the Internet. Internet connects Universities, federal and state government agencies, professional associations, commercial firms, colleges and secondary and even elementary schools. Thus, the Internet is community of people who work together to use the network. It is a cooperative effort of many people and organizations, all working to enhance the Net by their participation. One reason behind the development of Internet, is to help the research community by giving engineers and scientists real-time access to remote resources and to let them share information through electronic mail. One can be connected to the Internet by getting any of the following connections:
Direct connection: Permanents direct connection is available to a TCPI/IP (Transmission Control Protocol/Internet Protocol) network. This whole network is turn gets connected to the rest of the Internet. Direct Internet connections require huge initial investments and dedicated high-speed lines.

On demand direct Internet connection: This type of connection is almost identical to the one above, except that the requirement of dedicated high-speed lines is replaced by the standard system of telephone lines and a modem. The connection protocol used is Point-to-Point (PPP). With this type of connection, the full ranges of Internet tools are available.

Dial-up terminal connection: Here the connection to Internet is not direct but through an Internet service provider. The entire range of Internet tools like Gopher, Archie, etc. are available. In this one gets a dial-up connection to the service provider and the software on the service provider’s computer responds and sends back its response back to you.

E-Mail connections only: This is the easiest and the cheapest type of Internet connectivity and is similar to the previous category except that none of the other Internet tools are accessible.

Requirements to access the Internet

To access the Internet one need a computer that is connected to it. It could be a PC, a Macintosh or a multi-user system (UNIX based). One can be connected to the Internet via a phone line or through a dial-up connection.

The Internet has increased the vitality of and accessibility to library resources. The library catalogs, books, journals, references, periodical indexes are all available on the Internet and are accessible usable and
useful and can be retrieved using software such as Gopher, Veronica, Archie and World Wide Web (WWW). Because so many resources are available on the Net, which are beneficial to library users, the need to get an Internet connection in libraries is of great concern. Many libraries all around the world is looking towards in this direction so that they can help its users to keep current of latest happenings in the world and to provide current data on various subjects as and when required by them.

Several sources also exist to help users to keep themselves current with new resources and changes to existing ones. Hundreds of libraries around the world have plugged into the Internet, accessible to anyone who can do a remote login i.e. Telnet and can search library catalogs.

Internet is now being used by academic, corporate, public and school libraries for sending mail, cooperative research, subscription to journals and to get bibliographic and full-text resources. Resource discovery services help users to locate and retrieve information. These services contain tools for browsing, searching and organizing information distributed throughout the Internet.

The information that is available on Internet ranges from commercial databases, text of newspapers, magazines, journals, and newsletters to Net groups. One has access to fresh and recent text feeds for many newspapers, journals and columns through Campus Wide Information System (CWIS’s) or in Usenet if you subscribe to the ClariNet groups. The library and archive catalogs are searchable via RLIN and OCLC. This information may be general reference information such as the contents or encyclopedia, dictionaries and atlases or it may be real-time information such as weather readings, stock quotes and currency exchange rates.
The types of Information available via the Internet can be categorized as

- **Indexes, Abstracts and Full-text Information**: Information such as table of contents for journals and books, newspaper headlines and article summaries are all available on the Net. Also, full text information is available for searching and retrieving either in ASCII, fonted text, graphics or audio format.

- **Periodically generated Information**: One can get a lot of information which is generated on an hourly, daily or other basis, such as newspaper articles, weather maps, stock quotes, magazine contents and more on the Net.

- **Periodically revised Information**: Airline schedules and prices, product information, etc. are available on the Net.

- **Reference Information**: Reference information such as dictionaries, encyclopedias, legal references, etc.

- **Miscellaneous facts and fiction**: Textbooks, novels, poetry, music, etc. are available on the Net.

- **Online databases**: Economic indices, scientific data, etc.

- **Holdings**: List of items available from institutions such as book collections, recordings, maps, etc. not available in online digitized format.

Online information services provide better access to the information and better management i.e. searching, evaluating and delivering it. These services include online databases, online search and retrieval and information brokers put the data into computer readable format and make it accessible to use from terminals computers.
Services

There are basically four services one can do on the Internet:

- Electronic mail, or e-mail, is one of the most important of all that happens on the Internet. It is simple service that allows two people to send messages to each other in a near-real-time manner, of course, with e-mail one is not limited to sending a message to just one person, and the same message can be sent to many people. One can also attach a document or image to the message or can retrieve documents from other computers on the Internet by sending a command to a particular address. e-mail can also be used to retrieve documents from FTP servers and for taking part in special interest group discussions such as listservs and Usenet newsgroups. All one needs to send e-mail messages is a computer with some kind of connection to the Internet, and software on one’s computer designed for this purpose and e-mail address.

- File transfer Protocol, or `FTP`, refers to an Internet tool that allows one to move a file from one place to another. The word `file` is used in include any type of digital entity – documents, images, artwork, movies, sounds and software. Anything one can store on a computer can be moved with FTP. Many computers on the Internet have `anonymous FTP archives` containing public-access files that one can download on one’s computer.

- Telnet, a term used to mean `remote login`, is the ability to access and control another computer somewhere on the Internet. One can `log in` to the other computer and can then use the software on that computer. Often this service is used to search an information archive such as a public database or library resource. One can also use Telnet to log into one’s own Internet computer from another computer somewhere on the Internet. For example, if one is at
another place and has access to a computer on the Internet, one can telnet to one's own `Internet account' and read e-mail.

- Usenet is a global `bulletin board' service that uses that Internet as an access point. It is composed of thousand of topical grouping that one can read to keep in touch with news or discussions in those groups. A message posted to a newsgroup can be read, forwarded via e-mail, or followed up by posting a public response. A series of messages on the same topic is called a `thread'. Document called FAQ's (Frequency Asked Questions) try to answer many of the question that someone new to the group would have to keep the discussion in the group from covering the same ground over and over again.

In addition, in recent years some new tools have emerged that expands upon these four basic activities. These do not fall really into any one category, but rather they integrate many Internet processes in ways that can simplify and enhance the activity:

- Archie is a simple function that searches FTP archives on the Internet. It is accessible through both telnet and e-mail, as well as through freely available client software that one can obtain and install on one's own computer to access the Internet. Archie is useful for finding files when one known part or all of the file's name.
- Gopher is a software tool that connects a variety of computers and information archives on the Internet and displays them as a series of menu items. It was originally developed at the University of Minnesota as a campus-wide information system, but it quickly caught on as a way for anyone on the Internet to publish information and organize network resources.
- Veronica is a companion tool to Gopher. Veronica lets the user perform keyword searches of `gopherspace'. The results of the
searches are presented as a menu with items leading to more specific information. One can access veronica through a gopher server, just like gopher itself.

- There are a number of computers on the Internet that provide free or for-fee access to online databases. These are most often accessed using the telnet function. Depending on their purpose and format, online database can be broadly grouped into a variety of categories; Wide Area Information Services (WAIS), Campus Wide Information Services (CWIS), Online Public Access Catalogues (OPAC) and Commercial online services.

- The World Wide Web (WWW) is probably the newest and fastest growing Internet function. It is an ingenious front end to much of the information already on the Internet using the concept of hypertext to link information. Hypertext refers to a system of `point-and-click’ connections between information that allow the user to jump from one information source to another on the Internet without even thinking about it. All of the technical aspects of moving from computer to computer are hidden, leaving the researchers free to explore without interference.

### Commercial Services

- DIALOG Information Services: It is used by researchers and Librarians.

- DELPHI, CompuServe, etc.: They provide quick online access to stock quotes, the online Airline guide, encyclopedias and other information.

- Library Catalogue, Reference and Related services: OCLC (Online Computer Library Centre) and RLIN (Research Libraries Information Network) provide searching facility for library holding. RLIN is an online database service from the Research Libraries Group (RLG), RLIN has an online bibliographic database containing
description of the catalogued holdings of special collections, research libraries and archives. OCLC databases include archival and manuscript records from many state, museum and society archives. Information from the U.S. Library of Congress is available via the Internet. LOCIS (Library of Congress Information System) is available via Telnet.

The Library resources available on the Internet

- Library Catalogs: Now many academic libraries; a large number of public libraries and a small number of school libraries can access library catalogs using telnet access. The easiest way to access library catalogs is to connect one site that already has collected this information and provide links to the catalogs. Such a resource is included on many Gophers and WWW servers.

- Books: Many books are available on the Internet on Gopher, FTP and WWW. amazon.com is the site to access books. You can place order directly.

- Periodicals: The advantage of periodicals on Internet is their full-text searching capabilities. They are free publications available through discussion lists. FTP telnet, Gopher, WWW and e-mail requests. These periodicals are on commercial services with Internet access such as DIALOG and EXIS/NEXIS.

- Periodical Indexes: They are the most important features of a library. Location what articles have written on a subject or by a particular author is vital to research. Some of these indexes are located on Gopher or WWW server, whereas other are located on library catalogs that are accessible via Telnet. Some sites offer full-text searching of electronic journals, but usually the searching must be done one journal (or even issue) at a time.

- Reference Sources: The reference collection of the library is available on the Net. Directories, dictionaries, guides, gazetteers,
maps, etc. Are available on the Internet. These sources are updated frequently and they can be made full-text searchable. Two excellent examples are weather forecasts and currency exchange rates. Both of these are located on the Internet in forms that are updated at least one a day.

- Current services: They are various sources available to keep current including discussion lists, Gopher sites and WWW pages.

Categories of Organization who provide Internet Access
While there are a growing number of organization who provide Internet access, they can be divided into three basic categories:

- Internet Service Providers (ISP) or public-access Internet hosts are regional or national organizations that sell various degrees of access to the Internet, primarily for individual users;
- Commercial Online Services where users have access to services provided and maintained by the vendor, as well as 'gateways' to some of the Internet activities. These services usually require installation and use of software developed to connect and navigate their computer system. The major commercial online services are CompuServe, America Online, Genie, and Delphi.
- Bulletin Boards are usually locally sponsored computer systems that offer e-mail, file exchange, and areas for electronic discussions as well as varying degree of access to the Internet. These are usually pay or partially free services.

5.1 Networks
Network is the term that is widely used to connect computers that share resources and information with each other through some type of medium. The main objective of networking is optimum utilisation of available information resources through sharing. A computer network
allows user of one computer to use resources of another computer, which may be space, database, programmes or printer. Communication between computers exists under the control of a series of networking protocols or rules responsible for ensuring the safe delivery of data to its destination. Protocols govern the format of the data, how it is sent and how it is received. It allows each node on the network to receive data in a proper format so that it is understandable.

5.1.1 Computer Network

Based on the role played by the computer to transfer data/information, communication network can be called as computer network. A computer network is a category of computer systems wherein multiple computers are interconnected. A computer network consists of a set of communication channels interconnecting a set of computing devices or nodes that can communicate with each other. The nodes may be computers, terminals, workstations, or communication units of various kinds distributed over different location.

5.1.2 Need for Computer Network

The purpose of computer network is to share the resources of all computers among various users that are connected to the network. The resources to be shared include databases, software and computing resources not available at the computer site normally used by an organisation.

5.1.3 Classification of Networks

Based on Utility Criterion

The computer networks can be classified using the criterion of their utility. The major applications of computer networks are resource
sharing, data sharing, communication and data exchange. It is possible that one network can have all these applications or one or more such applications. However, if the main purpose of the networks is, say, resource sharing and other applications are subordinate then the network is considered as resource sharing network:

- **Resource Sharing Network** The networks can provide users with convenient access to special computing resources irrespective of the physical local of the users and the resources. The resources may include specialised computers, software or other devices that are extensive and are not affordable by an individual user. Example—a large super computer facility in an institution is accessed by several work-station situated at distance apart in the various departments/sections of the institute.

- **Data Sharing Network**, The networks provide access to unique databases from workstations situated at distance apart. eg. Remote access to stock exchange data or hotel and airline reservation system.

- **Communication and Data Exchange Networks**: The networks allow users to exchange data, graphs or documents and to communicate with each other using such devices as electronic mail, bulletin boards etc. irrespective of their location.

**Based on User Community:**

Sometimes the networks can be characterised as:

- **Private Networks**: Some corporation or other entity that controls access and use of network services to its staff usually owns these networks.

- **Public Networks**: These networks offer networking or network services to public, that is to say to any individual or organisation
that becomes the member or subscribed. The familiar example is of the telephone system.

- **Co-operative networks**: These networks are managed and support by their users. Example BITNET.

**Based on Architectures and Protocols**

Computer networks may consist of a large number of computer devices of various types, generally made by different vendor, and interconnected by a variety of transmission media, including telephone lines, satellites, digital microwaves radio, optical fibres, digital data lines etc. They may include local or wide are configuration. In this group of heterogeneous devices that are to be connected it is necessary to have compatibility of hardware and software or to have very complex interfaces to allow meaningful communication. The computer network architecture is meant for this purpose of providing connectivity, flexibility, modularity reliability, simplicity and diversity.

The network architecture generally refers to the protocols, message format and other standards, which communicate among different hardware, software and other devices, to achieve the objectives of the network. There are different standards in practice and based on these, networks were categorised as:

- Xerox Networks Systems (XNS) Architecture
- IBM’s System Network Architecture
- DEC’s Digital System Architecture

Network architecture refers to the arrangement of nodes and their interconnecting communication circuits, to represent the structure of networks and the significance of nodes in the network.
Based on the techniques used to transfer data and control, communication networks can be classified as:

- Switched Networks
- Broadcast Networks

- Switched Networks: The three main types of switched networks are:
  - Circuit Switched Networks: In circuits switched networks, the physical path between source and destination must be established before data can be transmitted. Upon establishing the connection, the circuit remains exclusively and continuously dedicated to the ongoing communication until completion.
  - Message Switched Networks: Message switching does not require a physical path between the sender and the receiver. The message first travels from its source to the next unit in the path. When the entire message is received at the intermediate unit, the next unit becomes available. This store and forward procedure continues until the packet reached its destination.
  - Packet Switched Networks: Packet switching is basically similar to message switching. The only difference between the two strategies is that packet switching decomposes message into smaller packet to overcome the long transmission delays inherent in message switching. Packet switching allows many packets to be transmitted simultaneously, thereby creating a pipeline effect.

- Broadcast Networks: Broadcast systems have no intermediate switching nodes. All stations share a single transmission channel; packets transmitted by one station are received by all other stations. An address field within the
packet specifies the destination of the packet. Packets that are intended for other stations are ignored. Two similar types of broadcast networks are packet radio and satellite networks. Another common instance of broadcasting is the Local Area Networks (LAN).

A Local Area Network (LAN) offers:

- Effective centralised control
- Multipath communication system
- Interdisciplinary in nature
- Aims at a total communication capability

Three basic ways of transmitting information are:

- Audio signals: such as voice transmission on radio
- Video signals: as used in television
- Binary digits: such as the electronic pulses in digital computers.

Each communication application has its own specifications and wiring. The task of designing a communication networks is too complex to be handled as a single unit. An alternative to the single unit design of a communications protocol is a structured approach that aims at dividing the communication task into manageable parts. The approach describes the communication function in terms of architecture. The architecture defines the relationship and interaction between network services and functions through common interfaces and protocols. This viewpoint has been adopted by the International Organisation for Standardisation (ISO) in their recommendation for standard network architecture.

This model is referred as Open System Interconnection (OSI). It defines a framework for the specification of protocol standards for
connecting heterogeneous computers. The model defines the rules and conventions for various functions within each layer. Specifies the general relation among these functions, and determines the constraints on the types of functions and their relations. Functions of the seven layers are as follows:

- **Physical Layer**: Physical transmission of information bits across the network
- **Data-link Layer**: Transmission of frames across network links.
- **Network Layer**: Support connection of multiple network links.
- **Transport Layer**: Transfer of data along a complete network path from an origin to a destination.
- **Presentation Layer**: Provides for application Systems to be independent of the form and representation of the data.
- **Session Layer**: Support of communications between application systems.
- **Application Layer**: Network access to application systems.

Based on Geographical Area Covered:

- **Local Area Networks (LAN)**:
  A Local Area Network (LAN) is a network, which is specially designed to interconnected data communicating devices within a limited geographical area. Lines allow high speed and accurate data transmission on dedicated networks. Thus, devices such as computers, storage devices, terminals, sensors, light pens and printers can be connected into a local area network. Most local area networks work within a small geographical area. LAN’s may be confined to one building, a university campus or a local neighbourhood with a range of upto 10 kilometers. Most LAN are privately owned. A single organisation will own the networks as
part of its computer installation. Because the distances covered are short local area networks are characterised by high speeds and low error rates. The main advantages of LAN are the ability to share equipment, such as host computers, printers etc. and to share data and allow it to be centrally controlled and located but made available to many users. LANs are used differently in different types of organisations. Academic libraries – for example, often operate with split buildings of disc storage and other expensive central facilities such as printers etc. Also LANs may be a means of making a workstation for an OPAC (Online Public Access Catalogue) available in different locations.

Metropolitan Area Networks (MAN):
A Metropolitan Area Network or MAN (plural: MANs) is basically a bigger version of a LAN and normally uses similar technology. It might cover a group of nearby corporate offices or city and might be either private or public. A MAN can support both data and voice, and might even be related to the local cable television network. A MAN just has one or two cables and does not contain switching elements, which shunt packets over one of several potential output lines. Not having to switch simplifies the design. A key aspect of a MAN is that there is broadcast medium to which all the computers are attached. This greatly simplifies the design compared to other kinds of networks. For example CALIBNET (Calcutta Library Network); DELNET (Delhi Library Network); ADINET (Ahmadabad Library Network).

Wide Area Networks (WAN):
Wide Area Networks (WANs) are those networks that cover a large geographic area, spanning cities countries or even continents. Typically, a WAN consists of a number of interconnected switching nodes. A transmission from any one device is routed through these internal nodes to
the specified destination device. These nodes are not concerned with the content of the data. Their purpose is to provide a switching facility that will move data from node to node until they reach their destination. Traditionally, WANs have been implemented using one of the two technologies: circuit switching and packet switching. More recently, frame relay and ATM technologies have assumed major roles. Some of the important WAN technologies are given below:

- Leased Lines
- Asymmetric Digital Subscribers Line (ADSL)
- Integrated Services Digital Networks (ISDN)
- Frame Relay
- Asynchronous Transfer Mode (ATM)

Based on Mode of Transmission:

- Cable Television: Broadband Networks use standard cable television technology, although the term “Broadband” is derived from the telephone world, in the computer networking context, “broadband” means any cable network using analog transmission. The cable TV has the potential to change the way in which the general public received both entertainment and information. The Cable TV offers expanded channel capacity, two-way communication and can easily be coupled with other communication technologies.

- Videotex: The Videotext systems transmit text or graphics stored in computer database via the telephone network for display on a television screen. The systems make the databases stored on powerful computer systems accessible through a television set
and a telephone. In order to function, Videotext systems need a telephone line, to which a television is connected via an electronic interface. This interface consists of (i) a control keyboard (for the user to use to type in response), (ii) a modem and (iii) an auto dialler for calling the database computer.

- **Teletext**: The Teletext is a system designed for the general public and mass communication. The Teletext is broad base, received and displayed by a Teletext set, which is an adapted television receiver. A keyboard/pad on the television set allows the user to select a specific frame. The best known services of Teletext in UK are BBC’s CEEFAX and ITV’s ORACLE, both of which transmit information of wide public interest.

- **Electronic Mail (E-Mail)**: In the Electronic Mail system, the transmission is via telecommunication network designed for data transmission. The E-Mail software packages are offered by many software suppliers and can be run on all multi-user computer systems. They provide a substitute to paper based mail or postal services or communication via the telephone. The key features of an E-Mail system are that, two or more people are able to communicate with one another, the message is transmitted via electronic signals, and not by voice or paper. The mail in the form of message, memorandum or document will be created in a word processing or computer system on the sender’s system, and the electronically delivered to the receiver’s system. The receiver may receive the document on VDU (Visual Display Unit) or on a local printer. E-Mail arrives within minutes.

- **Telex**: The Telex network is a well established and secure telecommunication network for communicating messages. Telex
is similar to typewriter having keyboard, internal storage and printer.

- Facsimile Transmission: The Facsimile transmission also known as telefacsimile transmission and Fax is a means of transmitting a copy of a page of text or graphics to remote location via telecommunication network; Fax is one possible technology for electronic document delivery. For example, British Library Document supply centre is using fax for document delivery.

- Electronic Journals: Central characteristics of the Electronic Journal is the use of electronic network communication as an aid in writing, submitting and referring papers and in other activities associated with the compilation of a journal.

- Videoconferencing: INSIS (Inter-institutional Integrated Services Information System) is the result of co-operation within the EEC (Eastern European Countries) directed towards the establishment of an inter-governmental communication network. The broadband system includes hidden cameras, stereophonic sound and a flat wall screen in colour. For instance, copies of an agreement between two governments can be signed at both sides and transmitted by Telefax to the other side of countersigning.

**Based on Network Topologies:**

The term topology, in the context of communication network, refers to the way in which the end points or stations of the networks are interconnected. A topology is defined by the layout of communications links and switching elements and it determines the data paths that may be used between any pair of stations. Topologies are named for the figures created by the web wiring called data path, used for data transfer. A network can be viewed as a simple pathway between points over which
information is conveyed. There may or may not be same control element accompanying the network that allows for proper routing of information. The multipoint topology has several points connected by a common circuits (communication path or line). Communications being between the controller and points on the network, not between points on the network. Bus or ring structures suggested that any point could communicate with any other point on the network. These basic topologies can be linked together to form Hybrid networks of considerable complexity.

5.1.4 Topologies of Network

One aspect of network architecture is its topology. The network topology is the way in which the communications links connect the equipment. In practice, many networks are composite networks which interlink network with different topologies and protocols. The interface between the networks is provided by a gateway switch.

**Star network:** derives its name from the fact that Star. There is one central controller (usually a computer) which has communication channels radiating outward. Each one is connected to a separate device such as a terminal or another computer. For two devices to send or receive data from one another, the data are routed through the central controller. These networks are typically found in cases where a large-scale central computer is connected to many terminals.
**Ring Network**: A ring network is a completely closed loop. A single communication channel with devices connected to it, runs through a building or office until the end of the channel connects back to the beginning. There is no central controller here unlike in Star Network.

**Hierarchical Network**: Hierarchical networks also known as tree networks consist of a central computer to which several other computers or nodes are connected. Each node in turn, has devices, such as terminals connected computerally. Each node acts as a star network. So a hierarchical network is essentially a multi-level star network. Nationwide organizations with divisional and regional stations are hierarchical networks.
Hierarchical Network

**Bus network:** A bus network is a single communication channel routed along a path in which various devices can be attached. In this networking adding or taking off one computer from the bus does not disturb the system operation or the rest of the network.
Table 1 Network Topologies

<table>
<thead>
<tr>
<th>TOPOLOGY</th>
<th>CHARACTERISTIC</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Star</td>
<td>Single controller in the middle system. All Communication through controller</td>
<td>Controller inoperative the system is down for all.</td>
</tr>
<tr>
<td>Ring</td>
<td>Neighbouring computers all messages travel in only messages travel in only one direction. Each unit serves as controller</td>
<td>When one unit is down the system could be down</td>
</tr>
<tr>
<td>Distributed Bus</td>
<td>Open-ended general purpose multiple access data path onto which all stations are attached by short dedicated data paths. Traffic travel in both directions.</td>
<td>Requires sophisticated data transmission</td>
</tr>
<tr>
<td>Loop</td>
<td>Combinesthe Star’s and Ring’s concept</td>
<td></td>
</tr>
<tr>
<td>Tree</td>
<td>Specialised distributed bus which reduced the distance between frequently interactive nodes</td>
<td>Difficult to expand once established</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Combination of Star, Ring and Bus concept. Combined advantages of above.</td>
<td></td>
</tr>
</tbody>
</table>

5.1.5 Layers of OSI Model Networks

Information is needed to be shared beyond a single work group. To connect two work groups, many networking products are available. These products work at different layers of the OSI model:

1. **System**: A system is a individual computer with communication capabilities added. This can range from a PC to a Super Computer.

2. **Network interface Unit**: It is a device containing hardware and software which supply the intelligence to control access to and communication across the network and to perform all communication Processing It is the means by which the computers
are connected functionally and physically to the network.

3. **Repeaters:** These are used if a network is to be expanded in excess of the maximum permitted segment length. These are basically signal amplifiers. The repeaters can only connect identical LANS, such as Ethernet/802.3 to Ethernet/802.3 or token ring to token ring for different cables; different repeaters are available, viz. twisted pair repeater, thin coaxial repeaters etc

4. **Bridge:** It is to interconnect two networks that use identical protocols. The bridge acts as an address filter, picking up packets from one LAN that are intended for a destination on another LAN and passing those packets on. The bridge operates at Data Link Layer. Bridges do not forward local traffic, thus reduce overall traffic in a multi-LAN inter network.

There are two types of Bridges; Transparent Bridges keep routing tables of physical address of network devices and forward traffic. They use a Spanning Tree Algorithm scheme for routing. Source Routing Bridges do not keep track of the route by which packets are sent. To establish a route, the station initiating communication broadcasts a discovery packet, which makes its way through the network's source routing bridges. The discovery packet keeps track of the bridges at crosses on the way to the destination.

5. **Router:** Routers provide a reliable, cost effective solution for interconnecting two networks of different protocols. The router operates at Network layer of the OSI model. Different routers support different set of protocols. Local Routers interconnect small to medium-sized networks. Remote routers links joining geographically separate networks into a large, complex wide area network.

6. **Gateway:** If the complexity or sophistication required increases, as between networks from different vendors or between LANs and public nets, gateways are used to make physical and higher level protocol
transformations. Gateways connect all seven layers of the OSI models.

7. **Modem**: A device which converts the digital signal to analog signal and vice-versa, capable of being transmitted over a conventional telephone line.

8. **Cables**: Different types of cables are available as transmission lines. The backbone of the network come in two basic varieties; Base-band and Broadband. Base-band communications links are twisted Pair wire and base-band coaxial cable. Brad band media are broadband co-axial and fiber optic cable.

9. **Twisted Pair Wire**: It is the cable used for telephone. The twisting standardizes the electrical properties throughout the length of the cable, and minimizes the interference created by adjacent wires in multi pair cable.

10. **Base band Coaxial Cable**: It is the cable used for CAT-V (Community Antenna Television) systems. The cable approximates 3/8 diameter, a central carrier is surrounded by a fine woven mesh of copper which forms an outer shell. This cable carries a single digital signal at high data rate up to 10 to 12 Mbps.

11. **Broadband Coaxial Cable**: It comes in different diameters with varying amounts of insulation. The cable may have the same construction as baseband coaxial. It can carry 50 to 100 television channels or thousands of voice and low speed data channels at rates 9.2 to 50 Kbps.

12. **Fiber Optic Cable**: In Fiber Optic Cable light signals are transmitted through a cable/waveguide composed of a bundle glass or plastic fibers.

13. **Trans receiver**: Trans receivers are used to connect nodes to the various Ethernet media. They are also known as Media Attachment Units (MAUs), attach to the Ethernet cable and provide an Application User
Interface, or AUI, connector for the computer. The AUI connector consists of a 15 pin D-shell type connector, female on the computer side, male on the Trans receiver side.

5.1.6 Components of Computer Networks

A computer network is composed of two types of components. System components that support transmission and communications, and Function oriented components that provide for end user applications. The following are major components of computer network.

- Data Processing Computers and Software are the traditional computers that support applications software systems. For most computer networks, these are computers that are in use at the time the network is established.

- Network support hardware includes interface hardware between the traditional computers and the data communications links.

- Data communications facilities are comprised of transmission facilities such as dedicated high-speed lines, switching centres and satellite facilities.

- Network control software is the software system that handles the transmission and routing of communications traffic in the network. This includes the software to support the communications protocol in use in the network.

- Terminals, printers and microcomputers are the hardware components available to end users of the computer network.
Terminal control units, multiplexors and modems are the hardware that interfaces between the terminals and printers and the networks transmission facilities.

5.2 Need of Resource Sharing

Due to limited fund and limited staff, it is impossible for any library to acquire this unlimited and endless knowledge. The only alternative is Resource Sharing. The need of resource sharing can be further explained through following points:

1. Proliferation of literature in each and every field of knowledge.
2. Multiplicity of documents in different subjects, languages and formats.
4. Increase in reading community and information seeker.
5. Diversity of user group and their information needs.
6. Demand of pinpointed, exhaustive and expeditious Information services
7. The increased access to information and services a existing cost, and
8. Access to existing information and services less cost

5.2.1 Library Resource Sharing Networks

In the modern world of information explosion, resource sharing has become a prime necessity. Resource sharing is a way of library cooperation. Cooperation means, working together with same effort to achieve the objectives i.e. common work for a common goal. The various facets of cooperation are:

- Grouping of individuals having a common interest.
- Action by a group, for pursuing certain aims and target.
- Setting up of a permanent organization as an operational unit.
Resource sharing is a need based concept on the principle of give and take policy for mutual benefit. According to Allen Kent 'Resource Sharing is a mode of operations whereby functions are shared in common by a number of libraries.' With the explosion of multidimensional and multidirectional information and its high costs, the librarian faces a tedious problem to acquire relevant documents for the users. These conditions have led to the creation of library network for resource sharing.

Network technology has already come into being in libraries for resource sharing. A network is a form of arrangement for an administrative structure that links a group of individuals or organizations who have agreed to work together and/or share resources. A group of specific subject libraries come forward and pool their resources through network which is technically called library resources sharing network. UNISIST working documents defines Library Resource Sharing Network (LRSN) as - "A set of interrelated systems associated with communication facilities, which are cooperating together more or less formal agreements and instructional agreements in order to jointly implement information handling operation, with a view to pooling their resources and to offer better services to the users. They generally follow identical and computable rules and procedures.

5.2.2 Objectives of Library Resource Sharing Network

The main objectives of library resource sharing network are to:

1. Improve the sharing of resources among the member libraries;
2. Centralize the information processing system; and
3. Reduce the communication gap among the libraries.

Thus, Library Resource Sharing Network is very important for Bibliographic controlling of the explosion of literature and knowledge. It
also avoids duplication in purchase of costly documents. It facilitates
the adoption of new areas in every field of knowledge and improves the
mobility of data. Library resource sharing network is a helpful way to
develop the flow of information among the special information centers
libraries and other types of libraries.

5.2.3 Ways and Means for Library Resource Sharing

Previously the resource sharing was done through inter-library-loan with
the help of union catalogues and union directory of periodicals. Nowadays
generally the Library Resource Sharing Network is operated in two ways.

a. By telecommunication network.

b. By database in optical media.

5.3 Networking

The networking concept includes the development of cooperative
systems on libraries on geographical, subject, or other lines, each with
some kind of center that not only coordinates the internal activities of the
system but also serves as the system’s outlet to, and inlet from, the centers of
other systems. The concept is also hierarchical in that the centers of smaller
systems are channels to centers of larger networks at state, national, and
even international levels.

The concept of networking is intertwined with the history of interlibrary
loan. Early sponsors of interlibrary loan described it without calling it by
name. Networking began to develop on a national scale with the activities
of the I.C. The communication mechanism, or location tool, was born in 1901
when the LC began producing and distributing catalog cards. Resource
sharing exploded when the LC again led the way by designing and then
receiving national and international acceptance of the MARC format. It began
distributing these data in 1969.

### 5.3.1 Library Networking

The Computerized Library Network is a set of libraries and information centers homogeneous or heterogeneous, agree among themselves to share sources used in computers and modern means of communication. And

In the second definition, computer networks, including networks of libraries, as the installation of a set of Computers and Databases and Terminals for use by the beneficiaries.

Through this definition must be emphasis on five key aspects underlying information networks in all its forms and types, local, national, regional and global levels. Those aspects are the following:

1. A group of computers, various types and sizes, velocities and potential assimilation of data. Computers may be all Microcomputers, as is the case in modern trends in dealing with this type of computers with high-capacity storage and fast processors, or may be one or more computers Minicomputers operate on the basis of being a central computer or Servers

2. Terminal its outlets for the entry and retrieval of the information requested, or add what can be added to the light allows network system adopted. It is worth recalling that computers have become modern computers for the storage and processing of data as well as information retrieval within the library, at the same time can be server in the systems networks. In terms of storage capacity required, it depends on the operational needs it, if the networking, but not required to be at high energies.

3. Databases represent the raw materials necessary for the operation and functioning of any network of information networks, had reflect the Full text, or bibliographic database, or Abstracts.
4. Beneficiaries and End Users are the backbone of information networks, which is supposed to built and established for them.

5. Means of communication and media tanker Communication Mediator information

6. Tools and instruments required to build and implement the network, such as the composition of correspondence CCF data, tools and other tools that facilitate data and information exchange and transfer between the various parties Network

![Point to Point Link]

### 5.3.2 Objectives of Library network

A number of common goals and accepted by the system seeks information network and libraries to achieve them, as follows:

1. To secure the greatest possible sources of information for the public and researchers and users across the network outlets and libraries and centers participating.

2. Securing optimal investment for human resources, in particular technical and specialized thereof, through the adoption of joint projects and training.

3. Develop technical procedures and standardize and improve their performance, using standard means-tested and effective.

4. The optimal investment for information and communication technology, including secure better returns for libraries and other centers participating.
5. Building a spirit of cooperation between the departments of libraries and centers participating at the sectoral and national levels for the benefit of everyone.

6. Economy in expenditure by controlling the growth totals and sources are limiting the repetition and duplication

**5.3.3 Benefits of the library network**

In light of the goals and targets that it went we can sum up the benefits of a network of libraries and information centers as follows:

1. Reduce redundancy and duplication, but apprehensions and needed, in many books and periodicals, audio-visual materials and other materials required, especially costly materials and high prices.

2. The economy in the competencies and human capacities, especially the specialized and trained them, through centralized procedures and technical operations, cataloging cooperative, and classification and tags, and the work of abstract and indexing.

3. Sources provide adequate information and many of the beneficiaries of library services participation in the network, and can provide more than one library.

4. Standards specifications and methods of work in the participating libraries, where they are building the foundations of scientific standard adopted by all participating libraries.

5. The results economy in expenditure, which will result in their libraries in the network, can be invested in additional events and other activities for such libraries.

6. Provide more convictions when users and beneficiaries of computing.
5.3.4 Elements of the Library Network

When building or development of the network of libraries and information on any of the required levels, we have to identify the basic elements required system, which is as follows:

1. Goals and objectives to be achieved, namely, the overall purpose of the system network.
2. Activities and functions and tasks that require network system performance, for the purpose of achieving the goals and targets canned.
3. May require activities and number of jobs the previous requirements-before applying the rules - which must be completed, in addition to the activities inherent to the application and accompanying grid system, as well as the subsequent activities of the application.

5.3.5 Areas of cooperation in libraries

Studies identify a large number of areas of cooperation, which secured networks libraries, are as follows:

Cooperative acquisition, Centralized acquisition, Cooperative cataloging, centralized cataloging, Union Catalogs, Inter-library lending, Reference, Cooperative storage, Current awareness, On-line bibliographic, Selective dissemination of information, Training and human resources development, User education / sensitization, The virtual library.

5.3.6 Obstacles of the Library Network

If what previously explained advantages and benefits significant in the implementation and build a network of libraries, it does not mean that there are no obstacles that could delay or affecting any kind of cooperative systems. In particular networks and so that we can avoid such obstacles
or overcome them, we must first of the diagnosis and identification of the most important, as follows:

1. The disparity and inequality in the pillars and tools, devices and systems, all need a system and work Tools and Equipment in different libraries. All these need to be big and radical changes in some libraries wishing to participate in the network.

2. There are some specifics to the libraries and units participating in the network should abandon in favor of common goals and benefits of all participating libraries.

3. You may need some libraries, which is preparing to participate in the project network of libraries, to reorganize its indexes, and collections, or even some of its functions and procedures, in order to conform to the needs of network technical and material.

4. Some had feared libraries large and sophisticated wishing to participate in the network, increase administrative and technical burdens, because the services and the use of sources of information will be much greater than before beneficiaries of the pioneers of other smaller libraries in the network.

There are some common obstacles we can show as follow:

1. Lack of legal documents.

2. Lack of understanding of library and Information services in research and studies.

3. Lack of Information

4. Lack of moony

5. Poor or no knowledge of English or other foreign language.

6. Poor or no knowledge of computers.

7. Lack of qualified staff

8. Lack of time.
5.3.7 **Uniform standards & specifications for library network**

The specifications and standards required for libraries networks should be addressed and covers the technical aspects and documenting the following:

**First:** standards and specifications for data and bibliographic fixtures. The standards and specifications for dealing in bibliographic data used in all types of libraries and information centers because-as we said - without these specifications and standards becomes difficult and very costly transmission of data between many of the regulations also very difficult to access libraries in participating in the projects Resource Sharing. One of the most important of these standards and specifications as follows:

1. Adoption of the rules of Anglo-American AACR2 in new edition and revised in 1988, as well as special classes to deal with machine-readable data.
2. MARC and all the World installations comply with it
4. Special formulas and data communications from the MARC structure and composition-dependent write data and information (attribute) (NISO 239.2/150 2709)
5. Building basic structure of the library core fixed fields can be expanded or an addition as needed by local or internal library that accepts this combination is found from the fields in various global installations. And also take into account the structure that we operate within a local area network (LAN) or greater.

**Second:** standards and specifications for the networks and wire connecting devices.
Computing is no longer limited to building databases and provide services within a single library, but libraries began computerizes and mind work in an environment of local networks (LAN) or sectoral (MAN) or greater than that which is wide (WAN). Become computer now working terminals stations and (Servers). This requires of the library attention to the issue Wires and cables used and private networks and telecommunications and networking specifications of these supplies to ensure the speed and success of messaging and compatibility and integration with its own rules of procedure library procedures and linking with the outside world Months of these specifications wire and cables as follows:

1. Commercial Building Tele-communication cabling standard (EIA / TIA – 568A)
2. Tele-communication & Information Exchange between System Local & Metropolitan Network (BS ISO / IEC 802)
3. Small Computer System Interface (SCSI) (ANSI ASC X3.268)

**Third:** standards and specifications for transmission of information

The possibility of overlap and interaction successful between data in the library with the library is one of the other key goals pursued by any computerized system in any library. Linking successful conciliator and this also needs a set of protocols and specifications must participated libraries interested. These -as is standard-allow for the various systems that dialogue and Talk to each other electronically. These are:

1. Transmission Control Protocol / Internet Protocol (TCP/IP)
2. Open System Interconnection (OSI) Reference Model (ISO 7489)
3. Electronic Base Messaging (X.400) (IEEE 1224)
4. Information Retrieval Application Services for OSI (NISO 239.50)
5. Interlibrary Loan Data elements (NISO 239.63)
Fourth: standards and specifications for Text and Image and Multimedia

Changing the nature of computerized data and digital libraries in the form of traditional (script) to all other types image, audio and full motion make computing concepts completely changed where it is no longer find places where it is a computerized information (i.e., library) doors are open to us gates (Gateways) graduating from flowing to the world and to electronic information.

This talk is not and can theoretically access to practically implemented without also set of protocols, standards, and specifications, protocols include special forms allow for the transmission of images fixed and moved, and special languages which working on the composition and the establishment of electronic forms of non-text is best known as:

1. Graphic Interchange Format (GIF)
2. Portable Document Format (PDF)
3. Hypertext Markup Language (HTML)
4. Motion Picture Expert Group (MPEG) and
5. Client/ Server application Structure and Architecture

The network system relies on the existence of two computer systems, these systems or can happen through their contact and communication media available.

Where the nomination of one of the two servers and the system is receiving requests and queries through the online search done by the beneficiary from afar or absolve him.

The server usually waiting for the queries for the purpose of processing in order to give the answer, the second is a computerized system Client (customer)

5.3. 8 Problems in Development of Library Network

In addition to the problem of choosing right components there may be
other problems in implementation, and management of Networks. Some of the problems are listed below:

a) Government policy on import of computers and peripherals forces to change network design. Rental structure of telecom charges may also make the network unviable.

b) Financial crunch will create delay in project implementation which affects users and raises project cost.

c) Time lag between planning and implementation will create many technical and financial problems.

d) Decentralized decision making in the organization will delay the planning and implementation of the networks.

e) Outdated indigenous technology create-problems in inter-network integration due to mismatching of technology with the imported equipment.

f) Lack of measurement and evaluation creates problem in convincing the top management for networking approval

5.3.9 Importance of Library Network

A computer network is a collection of computers and peripheral devices (the network components) connected by communication links that allow the network components to work together. The network components may be located at many remote locations or within the same office. In any case, data communication is the glue that holds the network together.

Networking, in general, serves the following five important purposes:

1. It allows libraries to share hardware. Libraries often want peripheral devices that are affordable only if they are shared by several computers.

2. It allows information to be shared by all libraries. Some files/ data
may be used constantly throughout in a library

3. It allows electronic transfer of text. Libraries often transfer textual data from one place to another through a network. An E-Mail system may be used to distribute copies of documents, etc.

4. It allows for decentralizations of various data processing functions by different information centers.

5. It allows for communication between libraries. Various Libraries cooperating in performing certain tasks can link their computers in a network in order to share information. This allows for sharing of data and software and for rapid communication among the various network members.

5.3.10 Aims of libraries networks:

1. To promote sharing of resources;

2. Assist in acquisition and processing of Material;

3. Exchange of documents and data:

4. Cooperation and coordination in collection development.;

5. Help in the, establishment of referral service, online retrieval of information and online union catalogues;

6. To build bibliographic databases;

7. To build various other databases like that of projects, specialists, institutions, etc:

8. Electronic Mailing;

9. File transferring;

Library & Information networks help in:

1. Online retrieval of bibliographic, numeric, as well as full-text databases;
2. Compilation of reading lists, topical bibliographies, etc.;
3. To have bibliographic control by integrating national library catalogues etc.
4. Automatic book requesting systems:
5. Use of CD-ROM product, and services;
6. Remote data entry facility;
7. Downloading of information;
8. Library mailing, inter library requests and lending etc.
9. Document Delivery
10. Access to public domain information /data /software

5.3.11 Global Scenario of Networking

Library networking as a means of resource sharing has its beginning in 1970s and developed during 1980s. It is no wonder that libraries in all countries of the world have adopted one form other of networking.

United Stated of America (USA)

As early as in April 1970s Library of Congress Network Advisory Committee (ANC) attempted to explore ways in which a more cohesive nationwide system might be developed for sharing of bibliographic information.
Online Computerized Library Center (OCLC)

The largest and most famous bibliographic utility was established in 1967 as the Ohio College Library Center to serve as a computerized regional processing center for libraries in Ohio. The goals of OCLS were to support the member institutions by supplying information to them when and where they needed it, making it possible for them to cooperate in the educational and research activities of their individual users; and to make the resources of all member libraries available to the faculty and students at each institution by mean of an on-line union catalog. An off-line card production system was begun in 1970, followed by an on-line system for shared cataloging in 1971. The database consisted of Library of Congress MARC records plus original cataloging contributed by participating libraries.

In 1973 OCLC offered membership to libraries outside Ohio, and the name was changed twice to reflect a larger outreach. During the 1980s OCLC began serving libraries in England and Japan.

OCLC's Union List Component supports the efforts of groups creating and maintaining national, state, and regional union lists of serials. Interlibrary loan participants can display these holdings through OCLC's interlibrary loan subsystem.

The interlibrary loan subsystem enhances communication. The electronic mailing of requests reduces turnaround time, and requests are sent to libraries known to hold the requested items. Studies have shown that the subsystem processes loan requests faster than TWX, the U.S. Postal Service, or package-delivery services.

Interlibrary loan requests are verified in the on-line union catalog, eliminating the need to search multiple sources to identify an item and find out who holds it and whether it can be borrowed. Bibliographic information from the on-line union catalog, as well as borrower and lender constant data, transfer automatically to an online ILL record, virtually eliminating the need for typing.
Up to five potential lenders per request may be chosen with the system forwarding the request to each potential lender, m turn, until it is filled. The status of the request can be checked at any time in the subsystem’s electronic message file, which contains notices of new requests, recall and renewal notices, and other pertinent information. The system automatically notifies borrowers and lenders when items are overdue or lost. Policies and procedures for libraries and document suppliers can be obtained on-line in the name address directory.

OCLC offers lending credit for each item loaned through the OCLS interlibrary loan subsystem. The credit is recorded when the status of the record is changed to "shipped". Borrower and lender statistical reports can be ordered to keep up with ILL activity.

The system is somewhat more cumbersome for the lender than for the borrower. The lender must enter a status response, return address, and shipping date in order not to lose a transaction from the file. With the addition of its EPIC on-line service, OCLC greatly expanded the search and retrieval capabilities of the OCLC database. Searching the OCLC database on EPIC provides subject access to the full database for the first time, in addition to allowing retrieval by many more access points. A growing number of document suppliers like the LC, National Agricultural Library, British Library Document Supply Center (BLDSC), and University Microfilms International are part of the OCLC’s ILL network.

Statistics indicate that this network includes approximately (16500) library and information center participant, reaching restrictions or Records to the computer (30) million registered, covering (22) and indexed and classified material with comprehensive data for details and specifications and places of existence.
Research Libraries Information Network (RLIN)

The Research Libraries Group (RLG) was formed in 1974 to meet the needs of research libraries. In 1988 its membership consisted of 36 major U.S. universities and research institutions, each with a seat on the board of governors. After concluding that they needed to share a computer-based bibliographic processing system, RLG acquired BAT LOTS (Bibliographic Automation of Large Library Operations Using a Time-Sharing System), the library automation system developed in the late 1960s and early 1970s for the Standard University libraries. BALLOTS were replaced in 1982 by a large application program known as the Integrated Technical Processing System (TIPS).

RLG operates an international computer network and a large mainframe computer system to provide the infrastructure for the RLIN. RLIN services, which include acquisitions, cataloging, and interlibrary loan, are provided by RLG members to institutions worldwide through the Cooperative Library Authority for Systems and Services (CLASS), based in San Jose, California.

In addition to the RLG member library holdings, records are loaded into the database from the LC, CONSER (the CON version of Serials project), the National Library of Medicine, the Government Printing Office, and the British Library. Special databases in this network are the On-Line Avery Index to Architectural Periodicals, the Sale Catalog Index Project Input On-Line (SCIPIO), the Eighteenth Century Short Title Catalogue (ESTC), and the RLG Conspectus On-Line.

The On-Line Avery Index to Architectural Periodicals is produced and maintained by Columbia University. It indexes articles published since 1979 in over 1,000 journals in the fields of architecture, architectural design, history and practice of architecture, landscape architecture, city planning, historic preservation, and interior design and decoration. SCIPIO is a listing of art-sales catalogs.

The ESTC database contains bibliographic records for eighteenth-
century publications from Great Britain and its colonies, as well as for English-
language materials printed anywhere in the world during the same period. The British Library created the initial database, and the North American Center for ESTC, which is located at the University of California in Riverside, is adding North American holdings information as well as creating new bibliographic records for British imprints held by North American libraries. The American Antiquarian Society is also compiling American imprints in the North American Imprints Project.

Canada

Though co-operation among academic libraries started in 1960s, it was only at the provincial level and not at the national level. Tri-University Libraries (TRIUL), Ontario Universities Library co-operative system (OULCS), College Bibliocentre. (CB) and University of Toronto Library Automation System (UTLAS) are the prominent networks among academic Libraries in Canada.

United Kingdom (UK)

Resource sharing in university libraries in UK has been studied by Burkett. He points out, “The universities have been acting co-operatively for quite a number of years, both in lending to each other and latterly through regional and local networking, including participation in the British Union Catalogue of periodicals and in permitting use of their collection by external scholars”. As an example, he points out that the Universities of Bath, Bristol, Exeter and Southampton are active members of the South Western Regional Network and they make substantial loans to others libraries both within and outside the region. The university libraries created regional data banks based on the MARC records generated by British Library Bibliographical Services Division, several university libraries are involved in Birmingham Libraries Co-operative Mechanization project.
Burkett further points out the contribution made by the standing conference of National and University Libraries (SCONUL) in stimulating the exchange of information and collaborative efforts of all the university libraries and major national libraries in UK.

**Netherlands**

Alex klugist reports the decision of several Netherlands university libraries including Groningen and the Royal library in the Hague decided to work together in the Project for Integrated Catalogue Automation (PICA). The project developed library managements system for purchasing, loans and online cataloguing, on PDP 11/44 computer system.

**Australia**

The Australian Government patronesses a modest Australian program of resource sharing by approving a special provision within the National Library’s budget of resources. The National Library of Australia (NLA) has promoted and maintained a wide range of resource sharing network covering science and technology, industry the social sciences, etc, offering traditional computer-based and referral services. Australian databases are available on-line through the Australian Information Network (AUSINET). NLA also participates in the international exchange of MARC data. NLA is the national agency for cataloguing- in- publication (CIP), International Slandered Book Number (ISBN) and ISSN’S, and is the designated focal point for the Australian Library – Based Information System (ASLIB) and also for UNISIST, NATIS and GIP of UNESCO.

**South – East Asian Countries**

The International Federation of Library Association (IFLA) United Nation Educational, Scientific and Cultural Organization (UNESCO) seminar on resource sharing of libraries in developing countries in1977 at Antwerp University made some proposal for the South – East Asian
University Libraries Network (SAULNET). The Association of South – East Asian Nations (ASEAN) University Libraries favored for regional co-operation in the creation of a union list of serials and inter Library (IL) lending, periodicals network models are also outlined for SAULNET by Lin Huck Tec.

Japan

The National Library of Japan (NLJ), through a by law, holds an advisory role in co-coordinating libraries in Japan, nevertheless, it did not promote or maintain nationwide resource sharing network. However, it planned to co-ordinate the distribution machine-readable data as part of a national shared cataloging system.

China

Wang and Seng described the programmes at the 45th Annual meeting of ASIS in Columbus in 1982. They indicated that some plans have been "actively carried out to the effect national bibliographic data bases have been established with both Chinese and Western language materials" and that the present Chinese network "consisting of seven academic libraries will be made available to libraries at all levels".

Thailand


Pakistan

Anis Khurshid traces the status of library services in universities in Pakistan and found no library co-operation existing. He stressed the need for resource sharing under the central government and suggested creation and maintenance of an updated union list of serials. University
libraries need to be conceded with a telx system facilitating bibliographic uses, photocopying and loan library resources. Establishment of central agency for acquisition of foreign periodicals and specialization of subjects in universities, etc, are also suggested.

**India**

After independence the Union Government took interest in the development of library and Information services. Several committees and commission were appointed to look into the various issues relating to the library development. The committee of S.P. Sinha (1959) and S.R. Ranganathan (1965) have made pioneering studies on Indian libraries.

The project of the library committee of the UGC under the Chairmanship of Dr. S.R. Ranganathan submitted in 1959 and published in 1965 recommended :

a. Local, Regional and National co-ordination of book selection, subscription to loaned periodicals, and acquisition of back volumes of periodicals, among the libraries.

b. Co-operation in the fullest use of the holdings in the several libraries through a schemes of liberal inter library loan, and

c. production and continued maintenance of Union Catalogues of learned periodicals, select treatises in foreign languages other than English, and rare books research value for the holding of the libraries, in the field of social science and humanities by a public agency like the INSDOC for natural sciences.
Information and Library Network (INFLIBNET)

INFLIBNET is an autonomous Inter-University Centre of the University Grants Commission (UGC) of India. It is a major National Programme initiated by the UGC in 1991 with its Head Quarters at Gujarat University Campus, Ahmadabad. Initially started as a project under the IUCAA, it became an independent Inter-University Centre in 1996.

INFLIBNET is involved in modernizing university libraries in India and connecting them as well as information centers in the country through a nation-wide high speed data network using the state-of-art technologies for the optimum utilization of information. INFLIBNET is set out to be a major player in promoting scholarly communication among academicians and researchers in India.

The primary objectives of INFLIBNET as envisaged in Memorandum of Association are:

1. To implement computerization of operations and services in the libraries and information centers of the country.

2. To promote and establish communication facilities to improve capability in information transfer and access that provide support to scholarship, learning, research and academic pursuit through cooperation and involvement of agencies concerned.

3. To establish INFLIBNET: Information and Library Network a computer communication network for linking libraries and information centre in universities

4. To evolve standards and uniform guidelines in techniques, methods, procedures, computer hardware and software, services

5. To evolve a national network interconnecting various libraries and information centers in the country
6. To provide reliable access to document collection of libraries by creating on-line union catalogue of serials, theses/ dissertations, books, monographs and non-book materials (manuscripts, audio-visuals, computer data, multimedia, etc.) in various libraries in India:

7. To provide access to bibliographic information sources with citations, abstracts, etc.

8. To optimize information resource utilization through shared cataloguing, inter-library loan service

9. To train and develop human resources in the field of computerized library operations and networking to establish, manage and sustain INFLIBNET.

10. To establish appropriate control and monitoring system for the communication network and organize maintenance

11. To promote R&D and develop necessary facilities and create technical positions for realizing the objectives of the Centre;

In order to fulfill the broad objectives, INFLIBNET will do the following services:

Document Supply, Database, Catalogue Based, Collection Development, Communication Based, Access to Union Databases, CD-ROM Based Services to Academic Databases, INTERNET Based Services, INFLIBNET Subscribes to OCLC First Search, Access to CALIBER Proceedings, E-Subscription for the University System

**Arab World**

A sheriff authored an article on “the factors which effect the development of librarianship and library education in the Arab countries”. He observed that despite the fact that Arab countries have many things in common to share (language, religion, culture, history etc.) cooperation
among Arab libraries is totally unknown. The UNESCO regional seminar on library development in Arab speaking states held in 1960 recommended the establishment of a regional scheme for the cooperative acquisition of foreign publication and a union catalogue of such publication. However, nothing concrete has emerged.

There are many achievements in the field of information networks in the Arab world. It has developed some Arab countries since the 1980s last century, information networks including:

- The national network of scientific and technological information ENSTINET developed by the Academy of Scientific Research and Technology in the Arab Republic of Egypt.
- The network Egyptian universities EUN.
- The national network of information in Kuwait.
- The national network of information sponsored by the Center for Scientific Documentation in Iraq.
- The national network of information in Morocco.
- Tunisia have three institutions responsible for the completion of the national network of information; Regional Institute for Science Information and Communication is trying to accomplish remote network national research and technology, which currently comprises approximately thirty center, and is trying Computer Center "Alkowarazmi" establishment of a network of university correspondence data, also tries National Institute of libraries focus educational network EDUNET in secondary schools.
At the regional level there is an important Test including:

- Information network in the Morocco (MAGREBNET)
- The information network in the Gulf (GULFNET)
- The Arab Network of information (ARISNET)
- The Arab-regional Information Technology Network (RAITNET)

The Arab Tests (ARISNET) and (RAITNET) the ingathering Arab non-governmental initiative launched by the regional center for information technology and engineering programs in Egypt at the end of 1994 the highlighted two Arab tests at the national level in the area of networking.

Many of the specialized studies in this area refer to, not carry out information networks in the Arab world, in the different tasks should be; These networks still suffer bleaching and disability, and still activities to Arab, national, regional, and national in this regard ranged in their borders, the Arab countries not succeed to now in the establishment of an information network to share development information with each other.

The information society in the Arab World not yet prepared for effective networking, for the following reasons:

1. The unfavorable political conditions
2. The spirit of the rule of disharmony between the institutions of information at the national level.
3. Uneven economic conditions in the Arab world
4. The absence of manifestations of economic integration despite the availability of its elements essential
5. The disparity in the efficiency and effectiveness of long-range communication systems in the Arab countries.
6. The different working methods and tools, starting with the rules of indexing, and cataloging languages, and the techniques of computers and communications.

7. The absence of national priorities and national information, and the output of inaction on the development of national policies for information.

Obstacles encountered in the Arab Network of information

The study submitted to the first Forum, on the Arab Network of information out that the main obstacles facing the network are:

1. Trained: The first obstacle in this regard is the lack of trained manpower of sufficient quality and quantity, particularly specialized in modern technologies.

2. Financial support: facing this problem most Arab countries, except for the Arab Gulf States; Many Arab countries do not have adequate financial resources to develop the infrastructure for the telecommunications industry and the information necessary for the national networks of the information.

3. Regulatory framework: to a number of Arab countries adequate financial resources and the desire to build information systems, but lack the regulatory frameworks for the implementation of those systems.

4. Communications: to be addressing the problems of communication at: national and regional level, in order to secure information systems efficient and effective.

5. Stimulating beneficiaries: The use of the information system to stimulate users to use the information in their work or in the decision-making process.
6. Information Resources: Arab countries should make great efforts to increase information resources, particularly in the fields of science and technology.

7. Systems and programs: that the Arab information centers need to cataloging and classification systems and thesaurus and computer software to analysis the material in Arabic, especially when using automated techniques.

8. Development of the information industry: from infrastructure to help develop the Arab Network for the development of information industry in the Arab countries

**Egyptian Libraries Network (ELNET)**

The first Arab integrated digital network specializing in the area of libraries and information, established in February 8, 1998 as the first Egyptian-Arab site includes indexes Egyptian libraries which used the operating systems mechanism. Searchable database every library separately by the name of the library, type library, or maintain that the library is located. The index can be used common network, which offers the possibility of research in most indexes libraries available.

ELNET has been established to broaden the base of the common benefit of libraries, and provide the time and effort of researchers, through research libraries in databases available without the need to travel between these libraries. In addition, the integration between the library and rationalize their budgets and provide indexing and cooperative exchanges between the library. At the same time be deployed Egyptian intellectual production at different levels locally, regionally and globally.
ELNET includes public libraries, and specialized, Academy of various governorates of Egypt, which is updated databases, shared libraries in the network periodically. The Center for Information and Decision Support Cabinet on the continued introduction of other libraries unprecedented participation in the network of Egyptian libraries on the Internet. The Center welcomes the accession of any library Egyptian or Arab operate using automated systems to participate in the network.

### Egyptian Universities Network

<table>
<thead>
<tr>
<th>Sq</th>
<th>Name of University</th>
<th>No. of Libraries</th>
<th>No. of Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asuit</td>
<td>30</td>
<td>99,975</td>
</tr>
<tr>
<td>2</td>
<td>Helwan</td>
<td>19</td>
<td>146,490</td>
</tr>
<tr>
<td>3</td>
<td>Monofeya</td>
<td>11</td>
<td>38,903</td>
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<tr>
<td>4</td>
<td>Cairo</td>
<td>5</td>
<td>40,223</td>
</tr>
<tr>
<td>5</td>
<td>Alexandria</td>
<td>3</td>
<td>144,795</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>67</td>
<td>359,80</td>
</tr>
</tbody>
</table>

**The network aims to achieve a set of objectives which are follows:**

- Work to follow up the recent development in the area of library and information can specialist libraries and information taking place in the world, and the follow-up new in the area of library networks.
• Arab presence in the area of electronic periodicals specialized in the field of library and information, to provide the Arabic students and researcher up data information in the Arab world in line with global standards operating in the field of libraries and information.

• Serving scholars, researchers and advancement of scientific research specialist in the field of libraries and information, and provide a scientific article can scholars and researchers benefit from the form that allowed them to the development and progress of the research.

• The possibility of the presence of an intermediary through which the government can collect information specialist Arabs in general and particularly in the form of Egyptians working in solidarity to unite efforts and discuss ideas and put forward ideas and suggestions that help high level of the library profession and service on aspects of the Arab world.

• Presence new information receptacle which through dissemination research's in the field of library and information science, which will help to achieve the presence of specialist libraries and information Arab able to follow developments and transactions of digital technologies.

• Provide Digital Information Services are working on upgrading the Arab information society.

• Provide a digital network that will provide information sources various and specialized in the field of library and information sophisticated digital.

**Arabic Union Catalog (AUC)**

AUC one national infrastructure programs in the field of library and information has directed Arab sincere about attracting resources
informatics bibliography which representing the Arab intellectual production and publication non publication located in Arab and foreign libraries on the bibliographic database based on the specifications of global standards that would standardize data receptacles facilitate the exchange of information and bibliography recordings library on-line to avoid the recurrence of indexing than one receptacle tens even hundreds of times within the Arab libraries. This project is similar to many of the successful projects on the world level, especially center libraries computerized on-line known as ((OCLC)) in the United States of America. This project demands urgent Arab expressed by dozens or even hundreds of recommendations and resolutions of the symposiums and conferences in the Arab libraries and information over the past three decades. The project on the other hand is one of the most important efforts for the dissemination of Arab culture and knowledge on an international scale.

**Definition**

AUC is a collaborative framework aimed at uplifting the Arab practices in the Arabic libraries to aspire to every reader and researcher on the Arab in bibliography data quality and coverage of all the information available receptacles along all the Arab world for access to these objectives, the AUC allows libraries common set of Automate technical support consisting of bibliographic tools, thus contributing to raising the level of services in these libraries.

**The idea of the project**

The idea of this project based on a common framework for collective action to libraries for Arab participation in the Resource Sharing and reduces costs and standardizing rules in indexing and classification. On the other hand, the project aims to create a mechanism to limit Arab control and conservation of Arab heritage publication and non- published and distributed to a wide range of Arab and non-Arab libraries on the breadth of the whole world
Objectives

Achieve development AUC many aims, all Arab libraries seek to achieve and foremost Arab intellectual heritage inventory exists in the form of manuscript or in print, a mini database in a unified standard, and its consequences of unification of Arab efforts aimed at the technical work of indexing and classification and participation in sources to reduce the high costs resulting from the repeated indexing operation of the shell in more than one location between Arab countries.

The AUC will have a very large role in the spread of the Arab Book and the transfer of Arab knowledge to globe countries, and will have a significant impact on the Arab Book market, which reflected the directly on the movement of publishing and copyright.

The following account of some of the most important benefits of the AUC:

- Countless Arab intellectual heritages in a uniform standard database.
- Standardization of Arab efforts aimed at the technical work of indexing and classification.
- Reducing the costs of repeated indexing to the same receptacle in all libraries.
- Help to published of the Arab Book once documented in uniform rule.
- Receptacles transfer Arab knowledge to all the countries of the world.
- Encourage movement and the widening deployment of Arab literature.
- Service researchers and encourage scientific research.
- Bring distance between publisher and audience through the Internet.
- To reduce the cost of library automation.
- Development tool to help supply operations in Arabic libraries.
- Networking among Arab intellectuals.

**Standards & Techniques**

When creating a database AUC been adopting best international standards and the oldest global experiences for the formulation and bibliography described entrances taking into account the specificity of the Arab book and Arab culture and Islamic, which is:

1. Adoption and the Arabization of each composition formulas standard formula Mark 21
3. Adoption of a plan Dewey decimal classification, 21st edition pending addition of other plans for classification.
4. Develop a set of cataloging rules through the interpretation of the general rules of the rules of the Anglo-American Cataloging practitioner commensurate with the Arab Book.
5. A set of standard rules for the establishment of the Authority files of subjects, and the names of the bodies, and the names of people, addresses the Standard and chains, based on rules international and special of the Anglo American rules and Library of Congress.

**Technical requirements**

- Access to account for the use of the AUC.
- The modern version Browser father and the link to the Internet.
- Some office software such as Microsoft word And Acrobat Reader.
Basic AUC Services

1. Bibliographic Copy cataloguing: Authorize librarians to download records on Marc format from the AUC database to their local database.
2. Adding local data: Authorize librarians to add holdings information
3. Original cataloguing: Catalogue records on AUC database through the web.
4. Authority copy cataloguing: Authorize librarians to download Authority records on marc format from the AUC database to their local database.
5. References services: Online bibliographic search
6. Cataloging desktop: This service is providing to AUC members only. It provides permanent cataloguing assistance by highly qualified specialists and unlimited access to specialized AUC knowledge base.

Additional AUC Services

1. Temporary lodging catalogues: Provide libraries that are not implementing an ILS cataloging directly on with means to directly catalog their records to the AUC database and they search and retrieve them through the AUC interface.
2. Retrospective conversion: Provide bulk MARC bibliographic records to the library.
3. Download authority files: Provide to library complete authority files on marc format:
   - Subject heading, uniform title and geographic names.
   - Author names, corporate and meeting names.
4. Reclassification: Support to libraries as they migrate from one classification system to another (from LC to Dewey)

5. MARC Upgrade:
   a. Convert obsolete tags, indicators and subfields codes to their current equivalents.
   b. Delete invalid fields.
   c. Add missing fields.

6. Collections evaluation: To analyze the coverage of a specific domain by a library collection from various points of views:
   · Numbers of title
   · Date of acquisition
   · Variety

7. ILL (Inter library Loan): Give the technical possibility to manage inter library loan for the AUC member.

List of AUC Member

<table>
<thead>
<tr>
<th>Category</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic library</td>
<td>AEU-Zeid university</td>
</tr>
<tr>
<td>Specialized library</td>
<td>Arab World Institute</td>
</tr>
<tr>
<td>Public Library</td>
<td>Culture and Ministry</td>
</tr>
<tr>
<td>Public Library</td>
<td>Duby hall Library</td>
</tr>
<tr>
<td>Academic Library</td>
<td>Esharika University</td>
</tr>
<tr>
<td>Specialized library</td>
<td>General organization of Technical Education and Vocational Training</td>
</tr>
<tr>
<td>Academic library</td>
<td>Imam Muhammad Ibn Saud University</td>
</tr>
<tr>
<td>Academic library</td>
<td>Institut of Public Administration</td>
</tr>
<tr>
<td>Category</td>
<td>Institution</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Academic library</td>
<td>Islamic Lebanon University</td>
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<tr>
<td>Academic library</td>
<td>Islamic University of Al-Madinah</td>
</tr>
<tr>
<td>Academic library</td>
<td>Jidara University-Jordan</td>
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<tr>
<td>Academic library</td>
<td>Jordanian Union University</td>
</tr>
<tr>
<td>Specialized library</td>
<td>King Abdulaziz al Saoud foundation of Islamic and human science study in Casablanca</td>
</tr>
<tr>
<td>Specialized library</td>
<td>King Abdulaziz City for Science and Technology</td>
</tr>
<tr>
<td>Public library</td>
<td>King Abdulaziz Public Library</td>
</tr>
<tr>
<td>Academic library</td>
<td>King Abdulaziz University Jeddha</td>
</tr>
<tr>
<td>Academic library</td>
<td>King Fahd University of Petroleum and Mineral</td>
</tr>
<tr>
<td>Specialized library</td>
<td>King Faycal Center for Research and Islamic studies</td>
</tr>
<tr>
<td>Academic library</td>
<td>King Faysal University</td>
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<tr>
<td>Academic library</td>
<td>King Khaled University</td>
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<tr>
<td>Academic library</td>
<td>King Saud University</td>
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<tr>
<td>Specialized library</td>
<td>Kuwait Ministry of Education</td>
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<tr>
<td>National Library</td>
<td>Kuwait National Library</td>
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<tr>
<td>Academic library</td>
<td>Kuwait University</td>
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<tr>
<td>Specialized library</td>
<td>Saudi Aramco Library</td>
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<td>Specialized library</td>
<td>Saudi Arabia Ministry of Culture</td>
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<td>Academic library</td>
<td>Sultan Qaboos University</td>
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<tr>
<td>Specialized library</td>
<td>The Public Authority for Applied Education and Training</td>
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<td>Academic library</td>
<td>Umm Al-Qura University</td>
</tr>
<tr>
<td>Academic library</td>
<td>University of Algiers</td>
</tr>
</tbody>
</table>

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Iraq

The networking in Iraq was nationwide data network. The ministry of industry had established that by 1990 among the data networks other members were Baghdad University and the National Library. There were plans at that time to establish a nationwide library network as well, sponsored by the Iraqi Library Association. The network no longer exists. A research center and database system The Regional Documentation Center (RDC) of The Arab Gulf Cooperation Council (AGCC) had its headquarters at AL-Mustansiriyah University in Baghdad where it had been established in 1982. The RDC had data connections with the other six members of AGCC. EBSCO Teams with AL-Sharak to provide database for Iraqi Universities. As part of the Al-Sharaka Program for higher Education in Iraq, an important initiative undertaken by USAID and universities making up the Oklahoma higher education partners, all non-commercial institutions in Iraq have instant access to a wealth of information through participation by EBSCO Publishing. However the objectives of Network of university libraries have been achieved is what its lacunas are and how to overcome. The difficulties faced by the university libraries in Iraq have compelled the present researcher to select the topic. “Network of University libraries in Iraq”.

Iraqi Network of Information (INI) Scientific Knowledge Center

The network is an important step for the establishment of the cooperation and networks in Iraq, it was initiated by the Ministry of Industry and Minerals establishment of the Iraqi network of information at the beginning of the 1990s, to provide information services for the purposes of scientific research and, through the investment and application of
information technology in library & information centers, and resource sharing, for making it available to users via the Iraqi Network of information, which dependent databases on CD-ROM available in university libraries linking with the network. These libraries as following:

- Central Library of Baghdad University (network center)
- Central library of Basra University (network center)
- Central Library of Mosul University (network center)
- Central library of Mustansiriya University
- Central library of Technology University
- Central library of Tikrit University
- Central library of Babel University
- Central library of Kufa University
- Central library of Anbar University

These libraries linked with the Center Network (center of scientific knowledge) in 1992 and began providing services to beneficiaries in accordance with an agreement between all the libraries sharing in the network, and the libraries of (Baghdad, Mosul, Basra) its Transmitter & Recipient of the information, the network stopped its services in 1995 because of communication problems it has become difficult and costly at the same time,
The Ministry of Higher Education and Scientific Research doing to establish a network for communications and data transmission and information between Iraqi universities, and build a database of scientific research for professors, and participated in the libraries central in Iraq university, through the preparation of their collections of books and scientific periodicals in the databases for inclusion in the network. This is hortatory step from the Ministry to the university libraries the towards cooperation and networks.
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