COMPUTER NETWORK

BY

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(PGD/MCS/99/2000/914)

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NIGER STATE.

APRIL,2002

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A PROJECT WORK SUBMITED TO THE DEPARTMENT OF MATHEMATICS / COMPUTER SCIENCE, IN PARTIAL FULFULMENT OF THE REQUIREMENTS FOR THE AWARDOF A POST GRADUATE DIPLOMA (PGD) IN COMPUTER SCIENCE, FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE

APRIL,2002

CERTIFICATION

This is to certify that the project work carried out by Alhaji Mai-Iyali Bala Lawal meets the requirement for the award of a Postgraduate diploma in computer science of The Federal University of Technology Minna.

....

MAL. ISAH AUDU **DATE**
(*Supervisor*)

....

MR. L. N. EZEAKO **DATE**
(Head of Department)

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EXTERNAL EXAMINER **DATE**

DEDICATION

This project work is dedicated to my parents and Professor Aminu s. Mikailu, (Vice Chancellor, Usman Dan Fodio University Sokoto) for more than I can ever know.

ACKNOWLEDGEMENT

Praise be to Allah, the most high for giving me the opportunity to pursue this programme and the energy and endurance needed to withstand the pressures of academic endeavours.

I gratefully acknowledge my supervisor **Mal. Isah Audu** for his constant guidance and corrections and all other lecturers who in one way or the other assist me greatly.

My parents are not left out of the list of people to thank. I immensely thank them for laying the foundation of what I'm building upon now.

I can't but thank my wife for her moral support throughout my course of study.

ABSTRACT.

In every field of endeavour, it is a general belief that resources are always scarce at the expense of numerous wants. The computer science as a field of study is no doubt in this circle. To make full use of the available computer resources, a system known as computer Network which allows computer in the system to communicate with one another , was put in place.

Although, computer Network, has been in practice for quite sometimes, a good number of individuals, groups and organisations have not made good use of this great opportunity, either out of ignorance or lack of interest.

In this project, we try to explain what the computer network is all about with a view to educate and or rekindle the interest of computer users.

The "internet" or "net", which is the international form of computer Network, with the almost all the services available on it is discussed to some details.

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 Introduction

A computer network can be defined as the inter-connection of two or more computer systems with data communication devices for the purpose of exchanging data and information. It is made up of a communication software (Network Operating System), computer systems (Nodes), Network interface cards (connectors) and network cable (Medium).

Networking minimizes duplication of computer resources thus enabling the scarce resources to be shared among the computer systems. Thus, it permits the sharing of files, application software, products, printers, disk space, modem, faxes, CD- Rom drives and e-mail facilities.

Computer Network can be categorized into two:

Wired network and

Wireless network

Wired Network

A network is wired if it involves the use of network cables to establish a physical link among the nodes or computer resources.

The components of a wired network among others include

- Network Interface Card (NIC)
- Network Operating System (NOS)
- Network cable
- Bayonet-Locking Connector (BNC)

Wireless Network

This category of network allows the use of radio waves to transmit data or information from one node to another.

The components involve in this include:

Network Interface Card (NIC)

Network Operating System (NOS)

Network Antenna (Aerial)

Special Modem (Radio Modem)

1.2 Scope of the Study

The research will be limited in scope and coverage to the division of net work, topology, configuration, data transmission hard ware,

computer virus and general insecurity associated with net working cum possible security measures to safeguard against it.

In our study, there is no restriction to a particular organization, as such an individual, or group organization may use this research work to set up a net work system.

1.3 Aims and objectives of the study

Every research work, publication or what ever human beings do in life must have purpose or reasons. It is point blank that, resources are scarce and human wants are insatiable hence, the need to structure the scarce resources to meet human needs.

In this regard, we try to undergo a research work to see how computer resources can be shared among users and among computers themselves with little cost. The system is called net working, with it data and information can be transferred from one office to the other, from one department to another, from one country to another. Banking transactions, conferences, research works, advertisements and others are possible through network system. To be specific, these net work facilities that is to say E- Mail, E- commerce and E- banking system allow users to send mails, transacts international businesses and banking activities globally without tears provided they are on the net work.

Summarily, the aims and objectives of this project are as follows;

1. To make maximum use of computer resources for the enjoyment of all.
2. To allow users on the network where ever they may be share information without physical transfer of papers.
3. To transact international businesses and banking without stress.
4. To make available latest scientific / research information on the net.

5. To allow individuals to participate in seminars, research and conferences with people in different countries not in the same venue.
6. To make information available on theoretical basis for future academic exercises.
7. Engage in academic exercise beneficial to human intellectual development and gain.

CHAPTER TWO

2.1 General History of Computer

The development of modern computer has a long drawn history. The computer as man's brainchild has evolved over the years in response to his quest for efficient means of solving complicated calculation.

The origin of what may be called the modern computer may be traced to ancient times, when began to organize himself into complex societies. For a long span of time, the means man has for performing his calculations was the use of fingers, a method called digital calculation (from the Latin word, digitus meaning fingers). This method was very tedious and agitated man's thinking to open new frontiers in the realm of problem solving.

Several painstaking attempts in this direction finally gave birth to certain mechanical tools that facilitated man's calculation activities. One of the earliest tools was the Abacus or counting frame, the invention of which dated back to about 2000 BC for example, history has it that about the date, the abacus machine was successfully used China.

A man called Blaise Pascal in the year 1642 designed the first mechanical calculator or calculation machine. This machine did not have sufficient precision to handle

precise computation, as the level of mechanical engineering technology in Pascal's time was grossly insufficient. In 1694, a German mathematician, Leibnitz, invented a mechanical device that was capable of performing addition and subtraction. Later, in 1920, Thomas von Alsacc produced this machine on a large scale.

Along side the development of the mechanical calculator, there was also the invention of the slide rule, a tool with analogue representations, in the year 1633 by William Outghtred. The development of the mechanical calculator gave remarkable impetus to the development of machines having the having the same basic principles as the modern computers (the input and output units and the main unit). In 1801, a French man named Jacquard blazed the trail with the invention of punched card system for controlling the thread of his weaving looms. Charles Babbage, a professor at Cambridge University, followed in 1833 with his analytical engine which was capable of performing automatic calculations using punched cards. This could safely be called the first "digital computer". This machine had a peculiarity that it was made to work in a function of sequential commands. In this regard, the Babbage's mechanical machine represents a landmark in historical evolution of computers due to his perspective view of programming and calculating possibilities.

Another significant landmark in the realm of computing occurred in 1937 when Dr. John von Neumann succeeded, for the first time, to register programs in the memory of electronic devices. He also introduced the idea of using binary numbers instead of decimal numbers. The electronic device which incorporated this simplification was called the EDVAC (Electric Discrete Variable Automatic Computer).

In 1940, the Bell Society invested the first device with electromagnetic relays. This represented a historical monument in the evolution of the computer as it marked the beginning of a series of generations of computers.

The First Generation Computer

The first generation of computers was large systems using thousands of tubes called vacuum tubes. The development of first generation of computers dates back to the *Second World War* when the need arose for large machines to be employed in the calculation of ballistics. Chief among these computers was the ENIAC (Electronic Numerical Integrator and Calculator). This machine was developed *Professor J. P. Eckert* and *Dr. J. W. Waychly* at the University of Pennsylvania. Compared with its predecessors, ENIAC was a very fast machine. Sequence control was achieved by means of IBM cards and the memory was used to store numbers. The UNIAC (Universal Automatic Computer) was the first mass-produced computer of this generation. It was developed in 1950. Although the First Generation Computer represented the corner stone of modern computing they suffered the serious disadvantage of large size. The main characteristics of the First Generation Computers are therefore:

- Slow input/output of data/information
- Punched cards and paper tapes as input
- Use of vacuum tubes for memory
- High circle time (of the order of milliseconds)

- Use of magnetic drums for internal memory.

The Second Generation Computer

The invention of the solid-conductor devices known as transistor represented a significant landmark in the historical development of computers and this marked the advent of Second Generation Computers. The architecture of these machines was made to satisfy computing needs of speed, reliability and ease of use. a notable example of a computer in this family was the whirlwind built at the Massachusetts Institute of Technology and marked the first large machine to use magnetic cores for main memory. This development represented a factor of two or more in speed and a great increase in reliability over the previous types of memory. Notable characteristics of computers in this generation are therefore:

- Fast input/output of data
- Use of magnetic tapes beside the punched cards and paper tapes
- Improved memories
- Use of transistors
- Circle time expressed in microseconds

The Third Generation Computer

It was around 1965 that the Third Generation Computers came into being. The printed circuits in former computers were replaced by smaller integrated circuits (ICs). Cores, tiny rings of ferromagnetic material that helped greatly to minimize the memory access time, represented the memories of these machines. The whole

arrangement led to the increment of data processing speed and thus a considerable reduction in cost. Some characteristics of the computer in this generation are thus:

- Possibility of remote input/output
- Massive memories, eventually as backing memory
- Use of integrated circuits or micro-miniaturization
- Possibility of multiprogramming, multiprocessing and time sharing
- Cycle time expressed in hundreds of nano-seconds (10 – 9) considerable reduction in cost.

The Fourth Generation Computer

The advanced in large-scale integration technology introduced a new age of computers known as the Fourth Generation Computers that came into being in the early 1970's. computers in this era incorporate miniaturized electronic devices that possess desirable characteristics of low cycle time, high system reliability, decrease in the cost and physical size. This development has introduced new concepts into computing. For example, miniaturization has made computer networking very popular. Prominent characteristics of these computers are:

- Further development in memory technology
- Miniaturization
- Decreased cycle time
- High reliability
- Decreased in the cost of hardware
- Dcreased in the physical size.

The Fifth Generation Computers

The witnessed the birth of what may be called super-computer, which are widely employed in the area of artificial intelligence. These are called computers of the Fifth Generation. Computers in this generation possess the following characteristics:

- Smaller physical size,
- Lower access and cycle times,
- Higher processor speed and more complex architecture capable of handling sophisticated computing tasks.

2.2 Origin and Design of the Computer Network

The net originated as a spin-off of the cold war between the West and the East; particularly between the former USSR and the USA. This "armament race" took place in the 1960s, when both the West and East were pursuing researches that would give them military domination of the world "Bomb- proof" network was the interest generated in the military by the cold war. The arrangement was such that the network would be a peer-to-peer with this arrangement, there would no be a central host so that each is independent of the other. This ideal was chosen so that if part of the network was destroyed by nuclear attack, the remaining would continue to communicate. That was the beginning of the Internet.

By the Late 1960s the computer network of the military base was expanded to include other networks covering the colleges and universities. These various

networks were inter-linked so that researchers, scientists, governments, teachers and students could communicate and exchange ideas across the network.

As the volumes of messages grew, the computers on the network became less efficient and supporting bodies could not afford more computing resources to meet the growing demand of the traffic. Thereafter, the group resolved to forbid and discourage all messages on the net that were neither for scientific nor for educational purposes, so that the traffic could be effectively managed.

Internet Access Provider as a group came about as a result of the embargo placed on the type of messages. Through this group subscribers can gain access to the Net and exchange or download whatever form of information needed at a moderate price.

Ownership of the Internet

The government owned the facilities (infrastructure) of the Net originally and was maintained through the commitment and co-operation of the participants to the agreed goals.

Many of the resources on the, were provided and maintained by students, researchers and other interested groups on the Net. Each organization was always willing to contribute computer resources to the generality of the populace and this led to the success of the Net.

Most of the software on the Net is freeware. The resources were made available as a courtesy; because the money paid to the Internet Access Providers (IAPs) (the link/interface between the user and the net) cannot support the project, but the willingness of the participants to share the resources.

Payments for the Net

The bill of the Net is borne by all users, corporate or individual, for countries that have full connectivity. In such countries, the bill is independent of the number of distant connection and the number of 8 times you surf the Net. On the average, it is a bill or $20 every month in USA. For countries that enjoy not full connectively, the user is at the mercy of his IAP.

Internet Access Providers (IAPs)

Many commercial companies existed that formed the network groups and offer on line services, ever before the emergence of the Net. The services, however, more of e-mail communication services were provided to the subscribing members.

These groups include Compuserve, Delphi, Prodigy, Genie, and American On-line etc. These companies become IAPs with the advent of the Net. Internet Service Providers (ISPs) is another term, which is synonymous to IAPs.

These services/access providers are licensed companies that set up host computers to which million of subscribers are linked to the Net. In Nigeria, we have the following ISPs: International Network Communication (INC) Ltd, Link Serve Ltd, Microcom system Ltd, Ross Clayton Ltd (RCL), Cyberspace Ltd, Skannet Ltd. e.t.c

The features such as shopping guidelines, which were initially forbidden on the net, are now allowed. The ISPs provide access to e-mail, nationwide bulletin board and On-line chat systems that meet the request of individual on the net. To enforce discipline however, each ISP comes up with its own rules of On-line conduct to help provide the On-line community with the code of conduct necessary to live on the Net.

In general, the IAPs serve as the gates to the Net. The individual subscribers to the Net are not really known to the Net but only the various ISPs/IAPs. The resources that are needed to access the Net are available only on ISP/IAP systems. The ISPs are known to the Net while the subscribers are known to the ISPs because they maintain an account with them.

2.3 Research Methodology

There are several investigation techniques, among which a researcher must employ in his/her attempt to under take a research. In practical terms, the researcher is hardly able to employ a single investigation techniques in his attempt.

According to hill-way and lyrus in 1964 in their book title "Introduction to research" in any giving investigation, it may be necessary (infact frequently desirable) to use two or more of these general types of research in combination. There is no reason for instance, why one should not seek the solution of the problem by studying its history through an examination of document (content analysis) and then determine its present status by some sort survey.

This research work employed the following fact finding techniques;

1. text books
2. published papers
3. lecture handouts
4. observations
5. oral interviews

Interview

Interview is by far the most common and most satisfactory way of obtaining information, particularly to obtain information about objectives, constraints, allocation of duties, and problem and in the failure of the existing system.

The under listed guidelines were followed, in order to conduct a successful interview;

1. prepare for the interview by learning about the individual to be interviewed and the overall function of the organization.

2. outline the purpose and scope of the study, making sure that all questions are answered.
3. bring up specific question about procedure that might lead to information about area of improvement.
4. limit the amount of role taking in order to avoid distracting the person being interviewed.
5. at the end of the interview, analysed and summarized the information gathered.

2.4 Access, Services and Benefits of Computer Network

Types of Internet Access

Two types of Internet Access are available. They are:

i. Shell access

ii. PPP access

Shell Access

This is the type access between the user and the ISP, since the ISP is interface between the user and the Net, or, in other words the ISP is the user's gateway to the Net. The user only have access made available by their ISPs.

PPP Access

The point-to-point protocol (PPP) on the other hand, opens a direct link to the Net. Serial Line Interface protocol (SLIP) is another type of PPP. The two accesses enable users to have direct link to the Net. This is so by seeing each user as carrying the distinct identity of its ISP. With these connections, all the resources available on the Net are placed at the disposer of the user.

Communication Protocols

Computer systems of diverse configuration and operating system composed the Net, it is therefore, of paramount importance to know how information is passed from one system or network to another.

Protocol is a set of instructions or software, which dictates how to respond to specific situations. Protocols tell the various computer systems on the Net how to communicate.

A protocol called transmission control protocol/Internet protocol (TCP/IP) is responsible for inter-computer communication, while both the PPP and SLIP are specific to telephone dial-in to the Net.

Services and Resources On the Net

The capability of Net to exchange files, ideals among the various computer within the on-line community is a motivating attraction. The prominent attribute or feature of

the Net thus, is the availability of freeware to the on-line community, almost free of charge. This available freeware could be very useful software to help individuals in their various offices the following resources/protocol are used by the users o the Net to down load information from it.

The resources are:

(i) E-mail

(ii) World Wide Web

(iii) FTP

(iv) Archie

(v) Veronica

(vi) Finger

(vii) Telnet

(viii) Use Net etc.

E-Mail

This is no doubt, the most widely used resources on the Net. It is a common resource on the net for sending and receiving mails through the electronic device. For many business and personnel communications, it has become their life-wire.

To send e-mail involves, composing the message, connecting to the ISP and sending the message via computer to its destination (another computer). A single software may be used for sending, receiving and connecting to the host computer (Domain Server) on the Net.

An example is Microsoft windows 95/98 (main component) Depending on the set-up, two different software may be involved, such as:

(a) Custom/Internet Explorer for connecting to the host computer, and

(b) Eidola/Outlook Express for composing, sending and down loading mail.

This is similar to addressing a letter, apply postage stamp and mail at the post office. The letter starts its journey through one post office to other until it gets too its destination. With e-mail, however, it is similar but faster, indeed, it is a matter of seconds or minutes depending on the traffic congestion of the Net.

E-Mail Format

A typical of an E-mail is outlined below:

From:	The e-mail address of the sender
To:	The e-mail address of the recipient
Date:	The date the mail was written
Subject::	The headline or caption of the message
CC:	Stands for carbon copy. The address of other person to be send the mail.
BC:	Stands for Blind copy, same as CC but recipients of e-mail with BC will not have their names among the recipients list. Recognized recipients S to at CC.

Body 0f Text

This is usually short and written in conversational tone. It is composed of block paragraph without indentation and written in caps and lower case. All caps message is regarded as shouting on the cyber space.

E-mail Address Anatomy

All e-mail address are unique. They consist of four (4) major parts.

(i) The name of the subscriber

(ii) The @ sign (pronounced "at"

(iii) The name of the provider or Domain Name.

(iv) The classification of the Internet user.

(v) The country (optional).

There is diversification on classification depending on the nature of the establishment.

Some examples are:

COM – For commercial establishments

EDU – For educational institutions

ORG – For organizations

MIL – For military

Examples of e-mail address are:

(i) Kayo @ skannet. Com

where

Kayo is the user's name

Skannet is the provider's name

Com stands for commercial organization

NB is an ISP based in Ibadan

(ii) Kayo @ rill. nig. com.

Where

Kayo is the user's name

rill. nig is the provider's name and country (Nigeria)

com for commercial organization

NB rill – is an ISP based in Lagos

(iii) Charlie @ aol.com

E-mail System Configuration

- Pentium 233mmx and above
- 3.2 Gab Hard disk and 32 MB RAM and above
- SVGA Monitor
- Mouse/Keyboard
- Modem (internal or external 28.8, 33.6, 36.0, 40, 45 kbps)
- Telephone line.

World Wide Web

This is also referred to as www or W^3 or simply the Web. It is also known as a hypermedia environment on he net. The web is the premier Internet navigation tool. It is a hypertext and multimedia system that lets users hop around the net, read documents and access images and sounds linked to a service.

When people take about the web, they are often referring to Hypertext Markup Language (HTML) document on the net. HTML documents are also called home pages, which display attractive information (text and graphics) and allow easy access to other documents across the net.

There are Web browsers. These are just programs designed for viewing documents on the Net. This act is often referred to as surfing the Net. Examples of these Net browsers are spy's Mosaic, Netscape, Hot java, Windows Internet Explorer etc most browser provide fanciful point and clink graphical interfaces to resources on the Net through the web pages (Home pages) stored on the web site.

There are specific sites on the Net called Web sites that have unique factures or information. Each of these sites has a unique address called Uniform Resources Locator (URL) by which the site can be located or reached for whatever information. A typical URL anatomy is made up of three parts thus:

S/No	Part	Meaning
(i)	http: II	The protocol
(ii)	www-lycos.Com	The name of the computer where the information is located
(iii)	Indent html	The path and filename of file to retrieve.

The content of the part in the table above can be combined as a single address thus: http: II www. Lycos. Com/index. html. All web sites are addressed by adding http:II to the address.

The html stands for Hypertext Markup Language, which is the format for the files at the web sites. Hypertext is a term that refers to the various links that allow the user to access more information by clicking a marked text or icon.

Some Popular Websites

www. nba. com	National Basketball Association.
www. fifa. com	Federation of International Football Association (FIFA).
www. mircosoft. com	Microsoft Corporation.
www. Intel. com	Intel Corporation
www. Compaq. com	Compaq Computer Corporation
www. cyberspace. net .ng	Cyberspace Ltd.
www. Offapoly.edu. nag	Federal Polytechnic Offa.

FTP

The ability to exchange data and information has contributed to the success of the Net. The e-mail is capable of exchanging simple text documents but people may need to exchange files that are not pure texts. To this end, FTP is fundamental and prominent. It is used for transmitting data, information an object that are not pure texts such as executable files, graphic images, word processing and spreadsheets objects etc.

A number of FTP sites that anyone can hook on the Net hook onto to retrieve files that have been placed on a computer as a public service.

A typical format of FTP URL is

ftp: II ftp. namia. com.

or

ftp: II ckayo @ ftb. namia. com (if a user name is required).

Archie

This is one of the tools available on the Net. It is used for searching files on the Net. It is very useful when the name of the file to locate is known but the site is not known. Similarly, one might want to find a file that matches a particular criterion at the FTP sites. The Archie Servers can be though of as a database of all anonymous FTP sites in the world.

Examples are:

(i) Archie@archie.funet.fi (Finland address)

(ii) archie@archie.au. (Australia)

(iii) archie@archie.rutgers.edu (US)

(iv) archie@archie.doc.ic.ac.uk (UK) etc.

Gopher

This is perhaps another used to explore the Net, especially when the resource to locate is known but the location is not known.

These tools are menu driven, and provide user-friendly front-end to the Net resources searches, and information retrieval. When visiting a Gopher site through a live connection to the Net, one has to specify the name of the site, navigate through a series of hierarchical menus to desired resources. The desired resource can then be down loaded or read. Gopher has fallen in popularity in recent year, such that most of the Gopher mails servers have closed down.

Some Gopher sites are:

(i) Gopher @ ncc. go.jp (Japan)

(ii) Gopher @ pip. Shsh. edu. (US)

(iii) Gopher @ ehnet. CZ (Czech Republic)

Veronica

Searchable index for gopher space is provided by Veronica just as Archie does for FTP. Veronica demands or your search words and displays a list of menus that matches the search. You can then select on of the items and "gopher it".

Finger

This tool helps to locate other people on the Net. It enables you to obtain the e-mail address, name, phone number and other information about a particular user on the Net. Finger only requires the login name of the person to locate on the Net produces the lists of the various possibilities from which one can get the person he needs.

Telnet

Telnet is a protocol that enables the users commands to be executed on another computer at remote location. It turn the users to a terminal so that it would like accessing another server via one of the work stations.

The Telnet tool is of immense benefit to scientific and engineering researches as it allows several people to work together and share resources.

Usenet

The opportunity to interact and discuss with other people of some interest or Special Interest Group (SIG) through a Bulleting Board System (BBS) is one of the biggest

interests of a member of the online electronic community. The speed of electronic communication allow people in diverse locations to exchange information in an efficient way.

A news server is a repository of UseNet information. It is a central computer co-ordinates the transmission of pasted articles as well as the storage of the previous ones. A user can browse through the various articles on the news server through a news reader (a news reader a program that is used to sort articles on the server).

UseNet Basics or Vocabularies

Discussions on UseNet are categorized into news groups. A news group is an individual Bulletin Board System (BBS) forum or SIG dedicated to a specific topic. An article is the message or contribution dropped by a news group.

A user has to subscribe to a news group so the he can participate in a discussion. A lucker is a newcomer to the newsgroups, and an on going discussion within a newsgroup is called a thread.

Obviously, the UseNet is prone to some problems that could lead to misunderstanding between members of a newsgroup. Some posted article may hart another members. Feeling; which he may take as personal and hence respond in like manner. This is called flaming. If other member pick interest or take side, and

decide to raise the stake by contributing pros and cons thus resulting a communal war called a flame war on the Net.

Benefits of Net

There are a lot of benefits for members on line community. Among others they includes:

* Speedy access to information
* Reduced cost of business transactions
* Opened avenue for business transactions
* Online marketing/sales (e-commerce)
* Enhanced paperless office
* Enhanced communications etc.

Individual companies can create Web sites that are peculiar to their business. There, a visit to such sites ill reveal or the necessary information about such organizations. Take oversea countries, for instance, it is easy to search for a good school for your ward based on certain criteria. A visit to college Net Web site would make available thousands of college in the domain (i.e. http: II www. collegenet.com.). For funds or scholarships, another site would reveal everything (i.e. http: II www. student services. com/ fast web).

In fact, now the trend is or an intending applicant to these overseas school to visit the country on the Net, search or a good school, download the application or m on

request, fill and send it back to the school or processing. Imagine the amount of manpower, cost, time and energy saved by this approach.

More so, for a developing country like ours, where nothing seems working, where the educational system has collapsed, and there are not adequate textbooks to sustain the various disciplines, there are opportunities on the Net to access latest textbooks, read and/ or download. You can even find out or known the current researches in an area of interest.

All theses would cost enormous amounts of hard currency subscribing to the learned journals and magazines in essence, the ability to exchange information has contributed greatly to the success of the Net.

CHAPTER THREE

Analysis of Computer Network

3.1 Logical Division of Network

Logically, popular network can be divided into two (2) Via:

a. Peer-to-peer (Work group) network

b. Client-server (server based) network

Peer-to-Peer Network

Peer-to-peer type of networking system means computer-to-computer what? This network provides simple and inexpensive way to inter connect not more than ten (10) computers. It is very popular in small offices or departments in large organizations.

In this network, each computer can access the files stored on any of the computers on the network. Every computer in the system acts as both client and server. The capability of each node or computer in this type of network to store its own files and databases is a prominent feature.

Configuration of a typical-peer-to peer system

* Work stations.
* Pentium II 300MHz and above
* 4.3 GB Hard Disk

* 32 MB RAM
* 14" SVGA Monitor
* Dos 6.22
* 16/32-bit Ethernet card
* Printer
* HP Laser Jet/Epson printer.

Merits of Peer-to-Peer Network

1) Dedicated server is not needed
2) Easy installation and configuration.
3) There is need for dedicated administrator
4) Resources on all the workstations are sharable among themselves

Demerits of Peer-to-Peer Network

ii. The need for data backup on each computer.

iii. Loose security is associated with it.

iv. There is less control over the resources.

v. Users may have to remember many passwords based on the number of resources on the network.

Client-Server Network

This is a server-based network that is basically used for sharing data among the computers on the network. Besides, it provides a better security as all the resources of the network are centrally located on the server. A server-based network is a

system in which certain computers called clients, request services and other computers, called server, respond to these requests.

In client/server network, there is usually a dedicated central system called server on which the file of every user connected to the network are stored. It also provides an efficient way of connecting more computers to share information than the peer-to-peer system.

A server or file server is a computer that stores the file of other users. In other words a file server is a computer that is dedicated to the task of file serving. It is a computer that responds to the client's requests. We have file, print, Application, fax e.t.c. server.

A client or client server is a computer that can access information stored on a server.

A workstations refers to each personal computer on the network except the one dedicated as a server.

Features of a File Server

* All workstations in a peer-to-peer network could be a file server.
* A server is the computer which server all the workstations by storing and retrieving data from files stored on its disk.
* It may have monochrome monitors because people do not work on file server.
* A workstation operates independently or less there is a problem or for system administration.

* It has a fast processor, large capacity hard disk and large memory to accommodate the number of workstations.

Configuration Of A Typical Client/Server

1. Server

- Pentium III 700MHZ and above
- 20 GB hard drive
- 128 MB RAM
- 32. bit Ethernet card.

2. Network Software

i) Novell Netware 4.1 (10 users and above)

ii) Windows NT 4/5

3. Workstations

i. Pentium 400MHZ

ii. 14" SVGA Monitor

iii. 4.3 GB Hard drive (optional)

iv. 32 MS RAM

v. Printer

vi. HP Laser jet

Merits Of Client/Serve Network

1. The centralization of resources allows for proper management.
2. It is economical since it server duplication of resources.
3. Users need only to remember a single password for network login and access to resources.
4. There is efficiency as more powerful equipment are involved.

Demerits Of Client/ Server Network

1) The failure is high, since if the server fails, the entire system fails.
2) Provision of a dedicated administrator brings about overall additional costs.
3) All messages/requests are routed via the server and this can be slow.
4) Cost also increases due to requirements of dedicated hardware and specialized software.

See the appendix for the diagram of Peer-to-Peer and Server-based topologies.

Network Adapters

There are two widely used adapters and they are

* Ethernet adapter
* Token ring adapter

Ethernet Adapter

This method of exchanging information on the network is the most widely used. Ethernet works in a way similar to how people talk in a polite discussion. In this system, each workstation waits for a pause before sending information, so as to avoid collision, which occurs when two workstation send information at the same time.

Token Ring Adapter

This system or method allows the workstations on a network to pass on electronic token among themselves continuously. A token is a short message, which indicates that the network is free.

To send a file the workstation waits for a token, attaches the token to the file and passes it to the destination. This is then removed at the destination and the token returned to the network to indicate a free traffic.

Network Topologies

The physical connection of computers in a network is called topology. Topology categorized into physical and logical topologies. The physical topology describes the routes of the network cables as they link each node while the logical topology refers to how messages flow from one station to another.

The four (4) topologies include:

ii. Star

iii. Bus

iv. Ring

v. Mesh

Below is a brief explanation on each of them.

Bus Topology

This type of topology uses single communication line to line the various workstations, server and other peripheral devices on the network. Devices are easily added or removed using this configuration (topology).

See the appendix for Fig 1.2 Bus Topology

Ring Topology

This consists of interconnected workstations in a continuous ring format, messages are transferred from one workstation to another until the destination workstation is reached.

In this type of topology, the breaking down of workstation leads to the breaking of the network system.

See the appendix for Fig 1.3 Ring Topology

Star Topology

Star topology has a central server (host) to which all workstations are connected. The failure of one workstations does means seizure of the network from functioning.

However, If the server fails the entire network collapses. It is via the server that communication is possible within the network.

See the appendix for Fig 1.4 Star Topology

Mesh Topology

This uses separate cables to connect each device to everyone on the network, thus providing a distinct and straight communication line among the various PCs. This topology can highly tolerate fault and very easy to trouble-shoot as well.

See the appendix for Fig 1.5: Mesh Topology

Transmission Media

Transmission media are the channels through which data and information available on the network are transferred from one workstation to another. A range of transmission media can be used and the selection can be based on application, speed equipments, cost etc.

A number of data transmission media are available and this include:

i. Twisted pair cable

ii. Coaxial cable

iii. Fibre optic cable

iv. Microwave link

v. Satellite link

Twisted Pair Cable

Two variants (types) of this cable are available and these are the shielded (STP) and unshielded (UTP) cables. Twisting of cables reduces (crosstalk) electrical interference. The shielded cable has increased amount of insulation and hence it is noise-immuned. If is used in many network topologies including Ethernet, ARCNET, and IBM Token Ring Topologies. The unshielded cables have a bandwidth of a few MHZ. They have been used extensively in telephone systems. However, there is a limit to the speed and distance signals can travel on twisted pair cables.

Recent developments have seen the release network standard at 100 Mbps using twisted pair cabling. Twisted pair cable is defined on a five level or category . Each category is related in MHZ, which can be considered as offering the following capability.

* Category 1 ordinary telephone cable or Ras 232
* Category 2Data cable up to 4 Mbps
* Category 3 Data cable up to 16 Mbps
* Category 4 Data cable up to 20 Mbps
* Category 5 Data cable up to 100 Mbps

Examples of twisted pair cables are 10 Base T and 100 Base T.

Coaxial Cable

There are many types of coaxial cables reflecting the differing number and type of protection shields used and the two major characteristics impedance of 500ms (Ethernet) and 75 ohms (cable TV/CATV).

Coaxial cable is typically used in the TV industry and some LANS (Local Area Networks). This cable has two variants, which include.

(i) Thin Net (10 Base 5), which needs some specialists for installation and maintenance.

The thick cable has greater immunity for noise and is more durable. The thin cable on the other carries signals over short distances.

See the appendix for Fig: 1.6: Data Transmission Media

Fibre Optic Cable

Fibre optic cable consists of a single bundle of hair-like glass fibre along which signals travel as pulse of light. In essence, fibre optic cable uses light instead of electricity to carry information. This medium is however expensive but transmits at high speed and is very immune to interference.

Microwave Link

These are micro magnetic waves, which travel in straight lines. However, like Radio/TV transmission, the quality of signals reduces as they move farther away from the source. There are microwave towers serving as boosters that amplify and retransmit the signals to the next station. It is used for wireless connection.

Satelite Link

A geo-synchronous satellite, which orbits about 23,000 miles above the surface of the earth, is used for information communication the satellite is permanently stationed at a point on the planet so that it is continuously available for communication with all the points within its range.

The revolution of the satellite is at the same speed as the earth, so that earth-bound microwave is always in time with it devoid of continual adjustment. The satellite like microwave, makes use of wireless connection.

Some Information Exchange Terminologies

1. Collision: This occurs when two workstations attempts to transit information at exactly the same time.

2. Handshaking: As it implies in real life term refers to the way two devices exchange information in a network just like a handshake.

Networking Devices

Owing to distance involved in data transmission over the network, some devices are made available to allow easy transmission from one node to another these are:

i. Bridge

ii. Router

iii. Repeater

iv. Gateway

v. Switch

Router

This is a device or system which passes or routes messages from one LAN (Local Area Network) to another be it homogeneous or heterogeneous.

Bridge

This is a hardware device that is used to interconnect two similar (homogeneous) networks and also links two dissimilar (heterogeneous transmission media (twisted pair cables, coaxial and fibre optic).

Repeater

Limits exist for specified main trucking transmission lengths (500m for Ethernet) after which signals start to weaken and degrade (attenuate). Repeaters thus, are devices

that extend the span of network by accepting the data packet and regenerate it to restore it to its original format and strength. The data packet is then retained and transmitted. Repeaters also perform the function of regeneration, extension of collision fragments and automatic portioning and reconnections of the network in the event of a segment failure.

Gateway

This device connects heterogeneous networks with different protocols and architectures.

Switch

This is an electronic message translator between LANs and applications running a variety of different protocols.

Local and Wide Area Network

Based on the geographic coverage, network can be categorized or divided into three.

i. Local Area Network (LAN)

ii. Metropolitan Area Network (MAN)

iii. Wide Area Network (WAN)

Local Area Network (LAN)

This refers to the network that is within a geographically clustered area. Examples of LAN are networks within offices, campus and bank building. LANS make provision of the blocks for Internet works and WANs.

Metropolitan Area Network (MAN)

MAN is that type of network that is within a city or metropolis. This covers a wider area than LAN. Examples are networks that span a local government area, a city etc. It makes use of WAN technologies interconnect LANs within a specific geographic region such as a city or district.

Wide Area Network (WAN)

WAN is an offshoot of MAN. It covers geographical dispersed areas such as a state, a nation or a cabinet of the world. It is a collection of interconnected network in which a third-party commendations carries is used to transmit data and information's between networks.

See the appendix for Fig 1.7: Enterprise Wide Area Network

Internet (NET)

This is the interconnection of several WAN across the world. That is, it is Global Area Network (GAN) Internet is a global collection of many and different types of computers and computer networks. It can also be defined as a global interconnected network or networks, thus the name inter-network or Internet or simply the Net. It is a network that links the whole world thus turning the world into a global village.

Data Transmission Hardware

Modem

This is an acronymic for modulator and demodulator. It is a vital equipment for data communication system. The computer system is digital equipment generating digital signals, while the transmission medium (cable) is poised or suited to transmit analog signals. Therefore, the modem serves as equipment (modulator) which modulates the digital data from a sending device (PC) to a form suitable for transmission a cable (analog), which another modern (demodulator) at the destination demodulates the arriving analog data back to digital for the PC to comprehend.

See the appendix for Fig 1.8: Modem

Multiplexer/Demultiplexer (MUX)

A multiplexer is a digital or communication hardware device that allows several terminals to share the same communication line leading to a large saving online rental cost. All terminals will definitely be provided within separate channels if there were no multiplexer, before transmission can take place.

To transmit data from the source to the destination, two multiplexers are needed each one for the two ends. The multiplier at the source multiplexes the data from the terminal on to the phone line (cable) for the transmission to the destination, while the multiplexer at the destination demultiplexes the arriving data back to the various terminals. Thus, it appears as if each terminal has its own separate lines.

See the appendix for Fig I.9: The multiplexer

Concentrator

This equipment works in a way similar to that of multiplexer. It reduces the number of signals to be transmitted into fewer ones. For example 50 signals meant for transmission can be reduced to 35. Connectors are particularly useful when the data communication cost is high particularly for long distance communication. In other word, it can be regarded as equipment that collects and stores signals temporarily for batch transmission to the host computer.

Internet and Internet Connectivity

The Internet (Net)

This is a global collection of many different types of computers and computer networks that are interconnected together. The Internet can also be defined as a global interconnected networks; hence, the name Inter-network or Internet.

More generally, the net is a prowling collection of computer networks that spans the globe, connecting government, military, educational and commercial institutions as well as private citizens to a wide range of computer services, resources and information, thus reducing the whole world into a global village.

The Intranet

Intranet is a small version of the Net that is used within an office. It is an ideal system for distributing information such as phone/product listings and job opening.

Analogy of the Net

A good analogy of the Net is to consider a room filled with many spiders each spinning its own separate web. The various webs are interconnected in such a way that the spiders can travel freely within the maze.

The webs represent different computers and networks of different configurations and running on different Operating Systems (plat forms}. While the maze is the interconnected computers and networks all over the world called the Internet. Every message or document sent on the Net is received by the adjacent computer, which stores it and further transfers it to the next until the destination is reached.

3.2 Problems of Computer Network

Network Problems

In this chapter, we shall try to identify the possible cause and prevention of problems associated with a networking system. It is the responsibility of a networking system. It is the responsibility of a network Administrator to see that the network keeps on running once it is installed and functional. To keep a network productive, one must avoid potential problems. The problems associated with a network can be:

(i) Physical.

(ii) Electrical

(iii) Criminal

(iv) Viral

Physical Problem

The physical environment surrounding a computer has a great impact on the computers. If one feels comfortable in a room, the computers in thesame room possibly feel comfortable too. In general, however, the physical environment or area where you can protect your network includes temperature, air quality and magnetism.

Temperature

This factor has a definite effect on the computer. Components expand when hot and contract when cold. This can cause what is called chip creep, which means that integrated circuits gradually lose contact with their sockets. This can result into some problems, as chips would not be able to send or receive signals properly. Inside a working computer, the temperature can be as much as 40 degrees higher than the temperature outside the computer. The extract heat is the generated by the working computer components. Therefore, fans must be kept in proper working conditions to help extract out heat.

Ventilation

A computer is cooled down by fans circulating air through the computer case. The air should be free from dust, smoke particles, thermal installation and air, which can cause damage to the various components of the system. The life of a workstation can be cut in half by the king or air found in some offices.

Magnetism

Magnetism poses a serious problem to computers. It can damage or corrupt complete data on magnetic storage devices (like tapes, floppy disk and hand disk). In order not to allow your system to suffer serious loss of data, take care of this great potential threat or problem to your computers.

Electrical (Power) Problem

To most people, power outage means disability form on ability to complete a task in a good time, but with computers it is more than that. The problems include data loss, keyboard lockup, loss of file, allocation Table, hard disk crash, errors in executable and program burnt motherboard and reduction in PCs lie span. The power or electrical problem can be discussed as:

Sag (Brownout)

Sags also known as brownouts or half current are short-term decrease in voltage level and this of course is the most common power problem. Sags result from starting power demand by some electrical devices such as motors, compressors, elevators and refrigerators etc.

The sudden drop in voltage starves the computer of the needed power to function. In cause the frozen of keyboards, system crash and reduction in system's lifespan.

Blackout

This means the total loss in utility power. It can be caused by lightening storms, earthquakes demand on the power grid, accident etc.

The effect of blackout is loss of data or content of the RAM (Random Access Memory) and cachie memories, loss of File Allocation Table (FAT) etc.

Spike (Transient or Impulse)

This is a dramatic increase in voltage, which can be caused by lightening or blackout when an attempt is made to restore light.

A spike can enter electronic component through air-conditioners, a network phone line and may lead to catastrophic damage of the hardware. Your network can be protected against spike following the following guides:

1) Put your computers on separate circuits with separate circuit breakers.
2) Ensure proper ground of your PC.
3) Use a surge suppressor.
4) Use a UPS.

Surge

This is a short-term increase in voltage, typically lasting 1/120 of a second.
High-powered electric motor such as the air-conditioners and house hold appliances (cookers, refrigerators etc) cause surge.

Surge can cause destruction of hardware and the computer can be protected against surge by using regulators.

Noise

For electrical environment, noise is defined as a low voltage, low current, high frequency signal that interferes with normal network transmissions, often corrupting data. An oscilloscope can be used to check of the presence of noise. Noise can be classified into two main types in term of computer network:

i) Electromagnetic Interference (EMI), and

ii) Radio Frequency Interference (RFI)

Noise can distort signals to random fuzziness.

To minimize noise.

1. Proper ground equipment
2. Avoid placing cable close to possible EMI and RFI source.
3. Use shielding in cables whenever possible.

Cross talk

A cross talk occurs when an interference occur with normal transmission as a result of bring wire close to each other. Cross talk can result in data loss or corruption. To prevent this problem, increase the distances between wires. The problem can also be solved by shielding wires as we have with Fibre Optic Cable.

Static

Computer systems can also be damaged by the discharge of static electricity building. Static electricity can build to some dangerous levels before mass discharge of it at once. Its effect is that components tend to degrade overtime and fail later.

Electrostatic discharge can be avoided thus:

i. Always ground yourself and any equipment you will be working on.

ii. Never let any touch when you are working on sensitive equipment.

iii. Don't touch electrical leads of components or integrated circuits directly.

iv. Always use anti-static bags to transport and store components with integrated circuits.

Computer Crime and Insecurity:

The computer has permeated every home and business such as banking, insurance, hospital, education and manufacturing. The wide areas of application have brought about crime and insecurity on a global scale. In particular the advent of the Internet has brought tremendous benefits to the world, global trading, e-commerce, e-banking, faster information dissemination, and collaborative research works. This global trend has equally widened the scope of crime and insecurity.

Hacking is a practice by which fraudsters gain unauthorized access to the PCs of other people. Fraudulent Net Workers may trade off their subscriber's password for a fee. With the correct authorization code, the hackers have access to the important information inside the PC and can with them.

Before the proliferation of computers in the business world, computer crimes in business where carried out by people who would physically go to the bank premises, for example, and rob staff and customers at gunpoint.

However, with the level of computerization around, perpetrators (insiders and outsiders) use their skills and the formation technology to commit crime. This usually involves a huge amount of money.

Computer crime is a common thing in the countries of the world. It is however, noteworthy that the computer itself cannot commit crime except the users and operators. The forms of crime range from:

- Theft of both the hardware/software
- Vandalization of hardware
- Hacking, and
- Theft of physical cash and official documents.

Basic Definitions:

Crime:	As defined by the dictionary, means a violation of the law, especially a serious one.
Fraud:	Criminal deception done with the intention of gaining advantage, or something that constitutes a criminal deception.
Internet Fraud:	Perpetrating fraud on the net.
Computer crime:	This is the use of computer to perpetrate crime.
Hacker:	A user or person who illegally gains access into the network to access and manipulate data.

Level at which Crimes are Committed:

Computer crimes are committed at all operational levels of the computer. These are input output, software development and information transmission levels.

Input level: At this level crime is committed by the operator. The crime here has to do with feeding the computer with wrong data, which obviously would give wrong result. Garbage In Garbage Out (GIGO).

Output level: This involves selling to the competitor the result from computer. This can debase or jeopardize the interest of the firm.

Software level: The programmer to move certain amounts of money from one account to another can add Fictions codes. This is the level at which most crime occur. To prevent crime, most banks do not allow the software development to partake in the implementation process.

Information Transmission Level: With the level of networking and Internet, several resources of firms are more exposed to the outsiders. This allows hackers to gain access to firms in another country to perpetrate their evil acts.

Methods of committing crimes

A number of methods by which crimes are committed include:

1. *The Trojan Horse:* In this method programming skill is used to carry out illicit functions on the business software. This may involve transferring a small amount of money to a private account or copying confidential documents.

2. *The Salami Technique:* This method involves transferring funds in small quantities from large accounts to the criminal's account. The amount at a point in time may not be significant to the large account owner or the baker, but over a period of time it becomes enormous.

3. *Data swindling:* This involves falsely or changing data at the point of entry the data into the computer. It is a difficult to reconcile even by an eagle-eyed auditor.

4. *Logic Bomb:* In this method, codes are written to crash the system so that it would be difficult to crosscheck the extent of the crime. It is a common method employed by the fraudsters to cover up their acts. This method is very disastrous to the institutions as the systems become inaccessible and database crashed. Besides the amount stolen the firm would have to invest more to bring the system back to life.

5. *Wire Trapping:* This method allows criminals to tap valuable information from the ongoing telephone conversation or data transmission. The illegal taping of information is called eavesdropping.

6. *Trap Doors:* These are debugging tools in software for future update and maintenance. Criminals do capitalize on this to carry out his selfish interest.

7. *Data Leakage:* This is a software technique, which may be employed by criminals to perpetrate evil. This technique can be used to completely wipe out business data and information out of the computer system.

8. *Scavenging*: This is a method employed by fraudsters by sniffing around or information from the thrash can around the firm. From the can, he may be lucky to get valuable information with which he can break the security measure put in place by the firm.

9. *Super zapping*: This method gives more control to the programmer. It is a system diagnostic tool, which allows the programmer to carry out unrestricted modification to the business software. A criminal can capitalize on this to achieve his inordinate ambition.

10. *Piggy backing:* This method is used by criminals who snoop around the computer room to gain access to the physical facilities and the computer files. This situation is also possible when a user leaves a workstation without logoff.

The Computer Virus:

The computer virus is a program that propagates itself by attaching codes to other programs to data files. Computer viruses are man-made and are capable of causing irritating or malicious effects. They can disrupt the efficiency of the computer, cause irregular screen activities, destroys the secondary storage media and software contained therein. In act, these programs are destructive ones, written by brilliant destructive people. Technological explosion has indexed the scope of infection. Infection is no longer limited to contacts from diskettes. Packaging software onto

CDs has reduced the rate of infection because most CDs are Read Only; which do not give way to viruses replicate themselves on CDs.

However, the Internet is a global phenomenon. The intention of an average of the on-line community is to share ideas with one another, and perhaps download (copy files from the Net) information from the Net.

There are enormous viruses on the Net and obviously every member is potential victim. The formatting of diskettes to wipe out virus is not the best option and the available anti-virus toolkits may both be able to detect or remove all of these viruses. Some of these viruses include:

1. Windows NT Virus:

This virus is also called "Remote Explorer" It is very disastrous and has the capability of infecting the entire network by replicating itself on Windows NT systems. This virus makes use of the network administrator's privileges to spread across the network. It equally has a built in time routine that speeds up it propagation process between 3.00pm on Saturday and 6.00am on Sunday of the next day.

2. World Cup '98 Virus:

This virus came the first time during the last world cup tagged "France '98". It flashes some football messages on the screen before wiping off the operating system or the entire content of the hard disk. The virus asks some quizzes about football which if

you mess, you will be doomed. World cup '98 can strike any day of the year, whenever a document is created using Ms-word, particularly when the computer clock shows 12 seconds, or July 12, the date of the final between Brazil and France.

3. Princesses Diana Virus:

This virus is relatively harmless. It strikes only on 31st of each month to coincide with the day Lady Diana died. It display lyric from Elton John's "candle in the wind", when creating an Ms-word document.

4. Melissa Virus:

This is an e-mail virus that infects many mails. It has malicious codes that posed a great threat to communication, particularly the Net. Melissa has attacked or clogged thousands of e-mails servers around the world. This virus was programmed to infect computers through e-mail and replicates itself by attacking the first 50 e-mail addresses that arte available in the Ms-Outlook address book. It has infected over 100,000 computers.

5. I Love You Virus:

This is tagged.

"LOVE-LETTER-FOR-YOU. TXT. VBS".

It is sent through e-mail by displaying the message; "kindly check the attacked LOVELETTER coming from me". This is sent as an attachment to e-mail, and one opened, it replicates on the entire system using Microsoft Outlook. In general it affects the entire hard disk, particularly multimedia files.

Over 80% of PC users in the world run Microsoft software. There is a virus that targets this group of users. It attacks windows products like Windows 95, 98, NT.

Effects of Virus:

Some of the effects of virus on computer or Network system include:

i. Significant loss of data from the hard disk.

ii. Wreckage of the IT equipment.

iii. Clogging up e-mail computer servers.

iv. Automatic mailing of a copy of the virus to all the e-mail addresses.

v. Erasure of the contents of the CMOS, thus affecting date, time and other details that the computer needs to book.

3.3 Report of the Study

During the course of investigation a lot of information regarding the various components that make up the network was gathered. In a nutshell, we are able to realize that stand-alone systems are more costly than when they are allowed to share information among themselves. A number of basic benefits which may encourage one to embrace networking system include;

1. fast transmission of data/information
2. acquisition of vital information (locally and internationally)
3. possibility of interacting with people on the net all over the world

Operational Feasibility

It is operationally feaseable because people or organizations wants to;

a- transmit data information from one place to another without the physical movement of such items.

b- Be frugal in spending the available meager resources

c- More efficient means of data transmission

Technical Feasibility

Regarding the technical feasibility, the available system can be used together with other net work materials in order to set up the network.. The personnel available could also be trained in any of the numerously available computer institute around for various assignments.

Financial Feasibility

Financially it is more economical when computers are allowed to communicate among themselves than when each is on it is own. Any one who can afford three or more systems can surely try networking.

CHAPTER FOUR

4.1 Security and Control Measures:

Data communication networks are being used on a rapidly increasing scale for the conduct of many different kings of business transactions. Significantly, these are observable in airline seat reservation systems and the national and international back networks.

Since, the inceptions of commerce, there have been those who have sought to profit by eavesdropping upon or interfering with other people's communications. Technology has now made communication rapid, efficient and cheap. Unfortunately the same advanced features of communication technology have made the evil practices of the intruders easier. If the interest of an intruder is merely to over hear certain communications (a passive line-tap), devices can be constructed which will select relevant messages from as mass of multiplexed traffic, the in-band signally systems used by some telephone authorized land themselves particularly to this kind of attack. A higher level of sophistication is needed to interfere with and alter communications (an active line-up), but this is by no means beyond the capacity of the determined intruder.

Securing, thus, deals with the procedures to assure confidentiality, i.e. the protection of information from improper disclosure, modification or destruction.

Remote data processing companies design security features to prevent: non-customer access to information stored in this computer or transmitted over its network; customers gaining access to information about their customers; and authorized employee access to customer information.

Security Controls

Every organization's management needs to be aware of the need for a good system of controls and security over its transaction data and information system in order to be assured that the system produces reliable and accurate data and information.

"Audit Trail" of a transaction, i.e. studying the visible evidence of transaction processing. However, in a computerized system, there is only a visible evidence of input and output, while there is a remoteness in human involvement with large values of transactions processed at very high computer speed. This, no doubt shows that nay errors made are hard and sometimes very costly to correct.

Since, fraudulent use of computer facilities are becoming common ever in out country today, ranging from illegal data modification, file destruction etc. No management can afford not to install reliable systems of controls security into its computerized systems.

Generally, security controls involve:

i. Organizational Control

ii. Systems Development Control

iii. Procedural or Operational Controls.

i. Organizational Control

The organizational control measures among others should include.

(i) Shift method: This method allows computer operators to be placed on shift to avoid fraudulent activities that will readily take place if one person were allowed to be there consistently. It is a fundamental principle o control that no person should have too much responsibility, as this could lead to errors undetected or to acts which could be fraudulent.

(ii) Appointment of computer information librarian who keeps the following:

- Soft data files of transactions.
- Masters files
- Program files

The librarian also controls the submission of files to the control section for specific processing tasks and the receipt of those files after processing has been completed.

(iii) There must be separation of duties between software development and operations. This is vital to ensure that those personnel with the known how do not have the opportunity to abuse their skill in order to subvert the operations of the computer systems to their won advantage.

(iv) As a general rule, the operation of the computer by software development section of staff should be witnessed by a member of operation section staff.

(v) Computer room should be an area of restricted access. The computer operators should not be allowed to handle raw data.

(vi) Separation of duties will only be upheld if the management ensures that it is upheld and take steps to ensure that controls are not overridden. Manuals o procedures, for example, are a way of communicating control philosophy to all staff.

Operational Controls

Operational control measures include:

1. Provision of operational guides which are detailed enough, including forbidden operations.
2. Maintenance of hard-written operator 'log'.
3. Shift rotation where multi-shift working is employed.
4. Passwords to guard against improper access to the system.
5. Provision of passwords for data files and programs while these should be changed regularly or frequently. There scope of access to the computer system is proportionate to the user's security clearance and job responsibility. Access to specific portions of the database can be gained only by those whole jobs necessitate it.
6. Access to the data processing unit may be restricted to personnel with special badges and keys.
7. Computer systems may be provided special locking programs to prevent logging on.

8. File encryption is a major professional security measure where data are translated into secret codes by complex coding devices that scramble information before it is transmitted or stored. Data is principally encrypted on its way out of the computer and decrypted on its way back in.
9. An advanced security measure is the use of detectors that identity legitimate individual computer users by fingerprints or voice patterns. This is however, beyond many organization's installations in this country now.
10. Computerized records like hand-written books, should checked regularly to see that every thing is intact. This should be carried out by a well trained "security task force", specializing in maintaining data security, conducting system audits and asking question on continuous basis.
11. Selection and screening of users to computers sand computer stored data. Computer programmers should be carefully chosen by an organization as Attorney Accountants are being chosen.
12. Computer Ethics; which is a term used to refer to the standard of moral conduct in computer operations, should become part of the computer training to fight many computer crimes such as "Hacking" (the breaking of computer security measures).
13. Legislation against computer crimes where the law is well respected has been another way of combating computer crimes such as copy registration of 1964 in US for computer software. But in places where it is lawful to be unlawful, this is of no use to people of fraudulent or criminal composition.

14. The computer room should not be made the sole data storage room of an organization's data files. This as Manual Accounting environment is divided into sales, purchases, cash, payroll, different personnel can also be made to handle the different computerized operations of the computer units in our organizations.
15. Computer systems used or software development and testing should be separated from those for applications.
16. In house computer programmers would not be given free access to original program codes, while data input operations should be disallowed from programming. Any modification or maintenance of original programme should be authorized and supervised by a maintenance team.
17. There should be daily printed reports of all transactions, while managers can kept the floppy disks containing updated backup files to compare the files' attributes regularly with their back copies on the Hard disks so as to detect any possible changes to them.
18. In deed, directory listings can be kept by the managers, geographically distant away from the computer department, or kept in the library separate from the computer department to cross check with those on the fixed disks regularly. Any changes made to files illegally would be known studying files attributes (properties) size, time date. To achieve this, the computer system need clock. This security measures can however, be broken readily by smart computer users.

Computer Security

Computer system security involves putting in place a reliable security measure of protect both the physical and logical assess of the firm. Physical security refers to the security of the hardware facilities, magnetic disks and tapes etc and any other gadget that can be accessed illegally, stolen or destroyed.

Logical security involves building software checks/controls into software to disallow unauthorized personnel from gaining access into the software. This is achieved through the use of passwords and authorization codes.

Physical security Measures:

* Solid construction of the computer centre with secured windows.
* Provision of secured guards to control access to the centre.
* Provision of registers to monitor staff movement.
* Provision of alternative power supplies – Ups and generator to prevent accidental loss of data.
* Provision of efficient data recovery mechanism (back – ups) in case of fine, theft or canalization.
* Ensuring that equipment are switched off when not in use.
* Ensuring that wastes documents are properly thrashed or burnt.

Logical Security Measures:

- Provision of passwords for authorized users.

- Provision of security software to restrict the permission of the user to read only no modify, no copy and no delete operations.
- Provision of data encryption method.
- Provision of regular audit of all the completing resources.
- Provision of directory or program protection software to limit the user's activities to a specified directory or program.
- Provision of a mechanism to record the number of attempts made by a user at a login time.
- If more than two or three, it should trigger an alarm.
- Provision of a system to monitor the activities of all login users.

Prevention and Cure of Virus:

Computer viruses can be prevented or cured as follows:

a) Separate your business PC from the Internet PC used for surfing the Net.

b) Build a firewall to shield your network from attack.

c) Obtain regular updates of anti-virus toolkits.

d) Obtain e-mail virus alert software.

Anti-virus Toolkits:

Anti-virus are programs designed to fight against the virus program that may infect our PCs. Some of the available anti-virus toolkits are:

i. Norton Antivirus (NAV) toolkits.

ii. Dr. Solomon Antivirus toolkit (Toolkit).

iii. Microsoft Anti-Virus (MSAV).

iv. Mc AFEE Antivirus.

v. Trend PC- Collin.

4.2 System Development Controls:

These refer to control measures that can be put in place during software development. Among others these controls include.

i. Documentation of all procedure and system activities during the initial system development and maintenance stages.

ii. Careful setup of all master files and data.

iii. Review of development stages by scrupulous system analysts and the maintenance Team.

iv. Authorization and supervision of all activities of the system development programmers after system installation.

4.2 The Control Section

A good and functional control section is of great important to boosting security measurers of an organization. This should be created within the computer department to serve as the interface section between the User Department and the computer section. This will help to know where to begin tracing the source of any errors or acts frauds originating from computer department.

The duties of a control should include:

a. Examine any batches of data sent to be processed and ensuring that they are complete and authorized.
b. Keeping records of all incoming work, ensuring that the work arrives punctually; routing the work through a data conversion section and then to the computer room.
c. Obtaining output from the computer room and checking if for accuracy and completeness before routing it to the user department.
d. Obtaining the data or information files from the library and routing them to the computer room.
e. Acting upon error reports; dealing with the originating department, and processing the re-submission of rejected work.

4.3 Computer Ethics:

There is increased computer awareness, no doubt. The proliferation of PCs around the world, testis to this, and a lot of other professionals converging on the computing profession; hence the need to enforce the code of conduct governing the practice.

The computer Ethnics Institute of America proposed what is call the "Ten commandments of computer Ethics" as follows:

1) Thou shall not use computer to harm other people.
2) Thou shall not interfere with other people's computer work.
3) Thou shall not snoop around other people's computer files.
4) Thou shall not use computer to steal.

5) Thou shall not use computer to bear false witness.

6) Thou shall not use proprietary software for which you have not paid.

7) Thou shall not use other people's computer resources without authorization and proper compensation.

8) Thou shall not appropriate people's intellectual output.

9) Thou shall think about social consequence of the program you writing or system you are designing.

10) Thou shall always use a computer in ways that ensure consideration and respects or your fellow humans.

CHAPTER FIVE

5.1 Achievement of the Study

The research conducted on network system show that any individual. group or organization who implements it would have the following achievements.

a- Better management of information: The network system allows transmission of data among the computer on the network, thereby reducing the paper usage.

b- High speed of data transmission: Individual users can source Information or data available at the same time and at a very high speed.

c- High degree of accuracy and reliability: It is a general belief that computers are highly reliable, with data and information being transmitted electronically, the rate at which such items are distorted during physical transmission is reduced.

5.2 Summary

Networking which is the interconnection of computers is no doubt a useful tool in the modern world of information technology (IT). Network is not only economic, but allows the sharing of date and information among the on-line members. Such sharing o data and information may be local (when the sharing is within an office). Local Area Network (LAN) metropolitan (when the sharing is within a geographical e.g Local Government Area), Metropolitan Area Network (MAN); and wide (when the sharing is among states or countries) Wide Area Network (WAN).

An extension of WAN, called international network, which is shortened to Internet, or simply the Net makes the sharing of data information possible across the world, thereby reducing the entire world community to global village. A number of benefits such as e-commerce, e-mail and so on are available on the Net for member's use.

Although, the Internet is vulnerable to attacks or has opened computer facilities to more attacks from criminal or fraudsters all over the world, who use computers to perpetrate evils on the Net, good security measures are in place to help check the menace of this class of people.

5.3 Recommendation

It is clear that the benefit embedded in the Net tremendous. I, therefore, people should get discouraged because of the activities of the fraudulent or authorized users; particularly that good security measures are available.

It is my opinion that the various securing measures be vigorous enforced, to curtail the wanton illegal acts of the hackers or fraudsters let us join the Net, the world of Information Technology (IT).

5.4 Conclusion:

There is virtually nothing on this earth that has benefits without the side of it. No doubt what we stand to benefit from the net is much more than the harms therein. We should therefore, not be discouraged by the criminals. It is a venture worthy of being kept.

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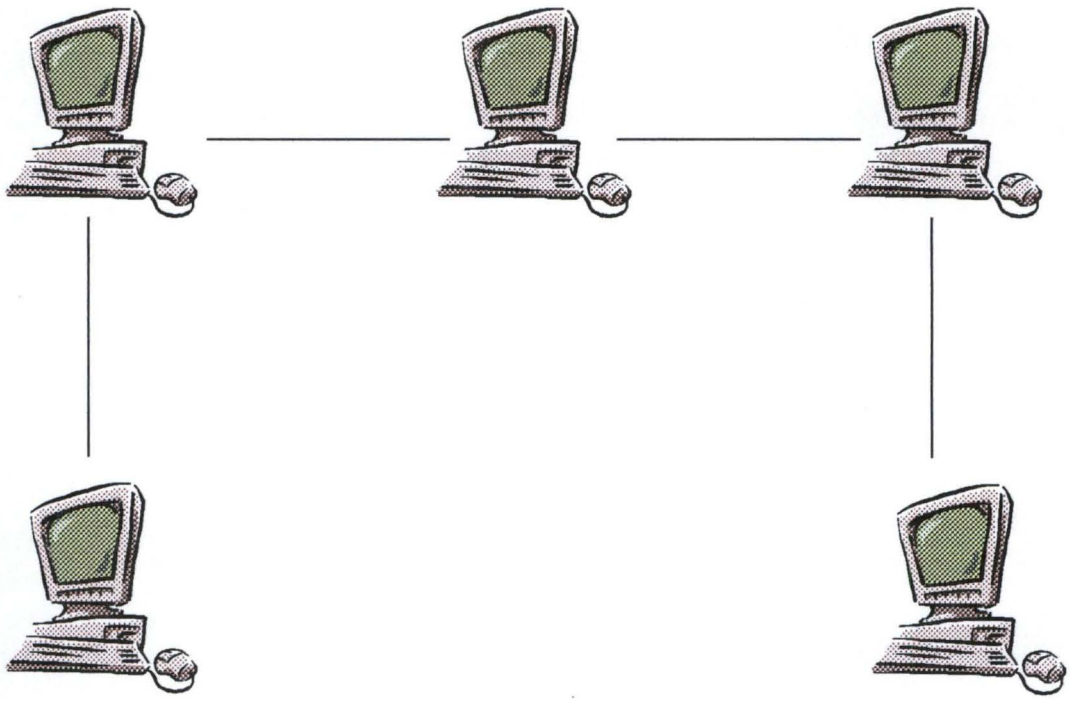
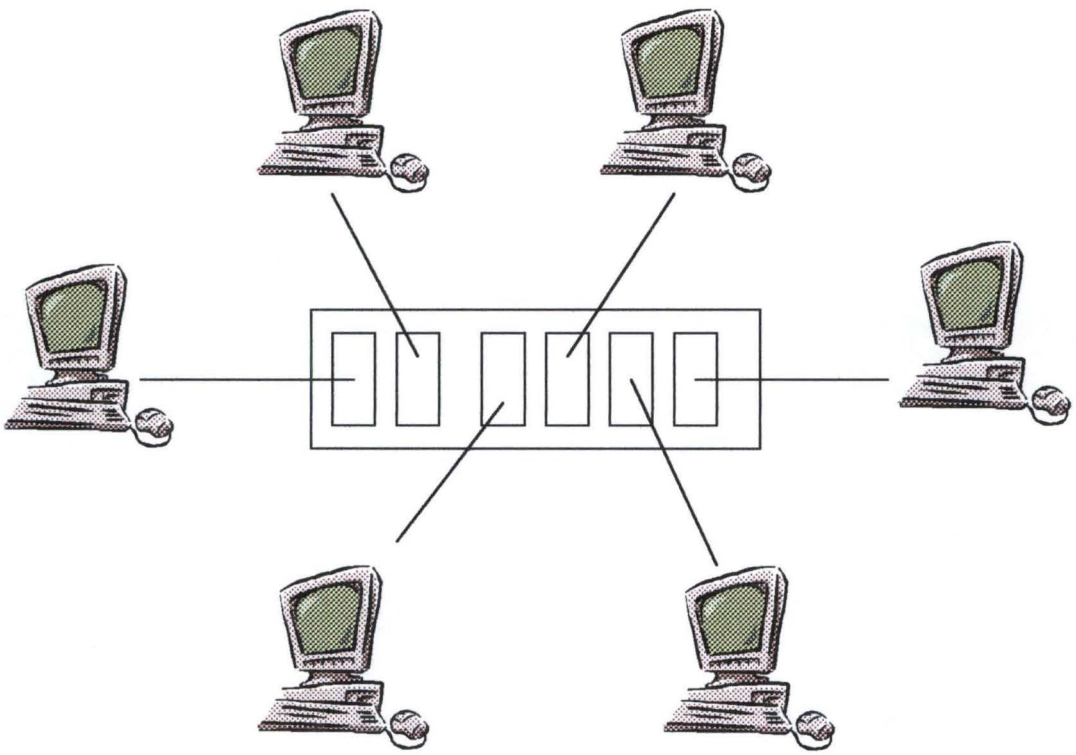
5.6 Appendix



PEER- TO- PEER
fig 1.1



CLIET/SERVER fig 1.1

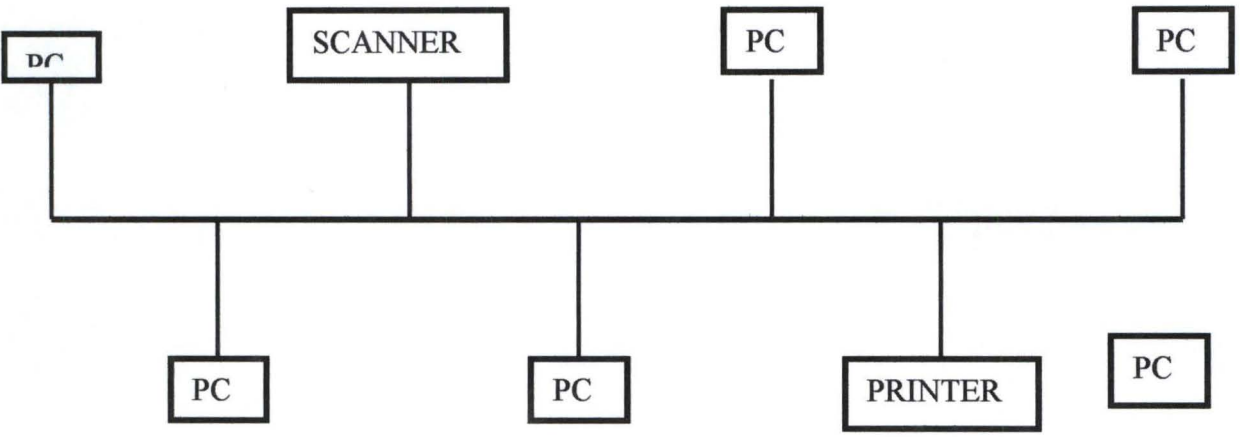


Fig. 1.2 bus topology

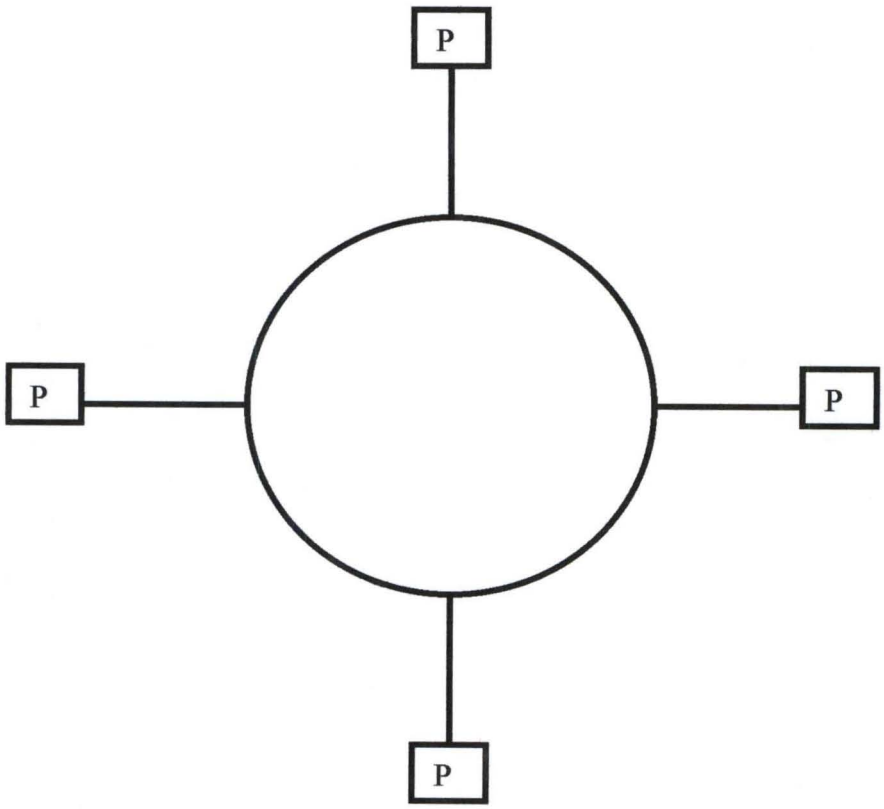


Fig 1.3 ring topology

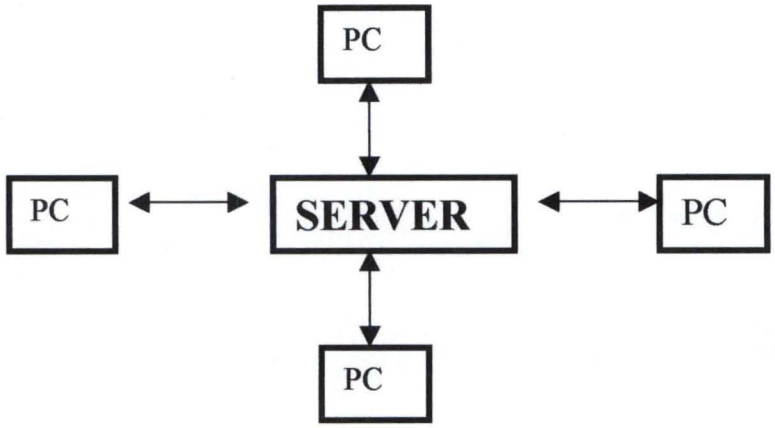


Fig 1.4 star topology

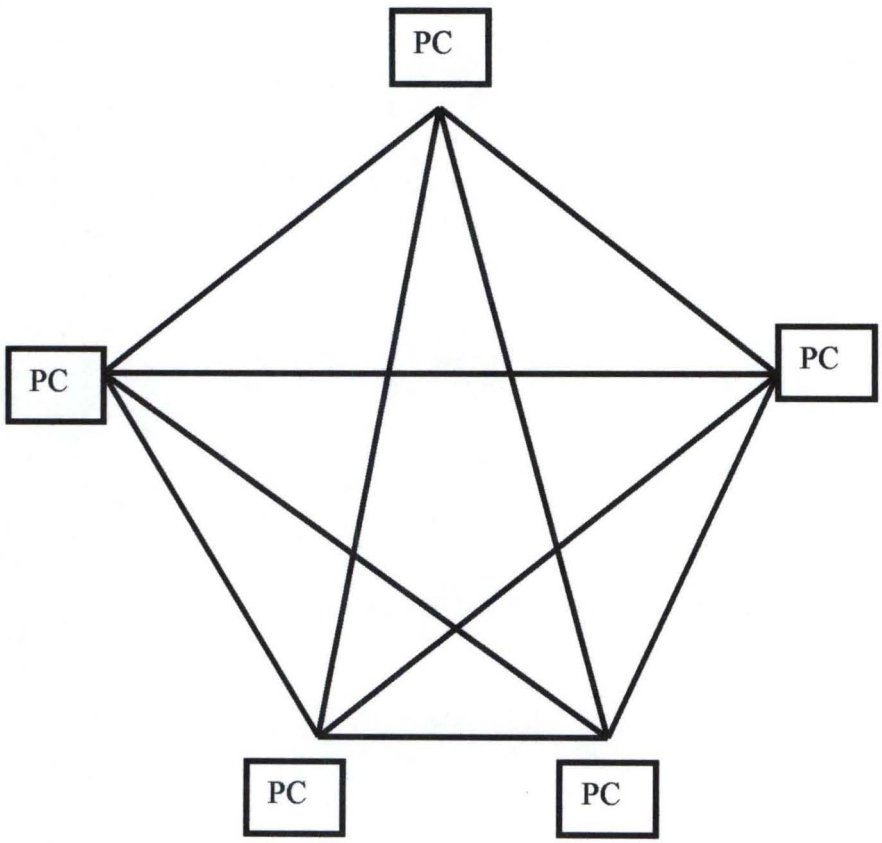


Fig 1.5 mesh topology

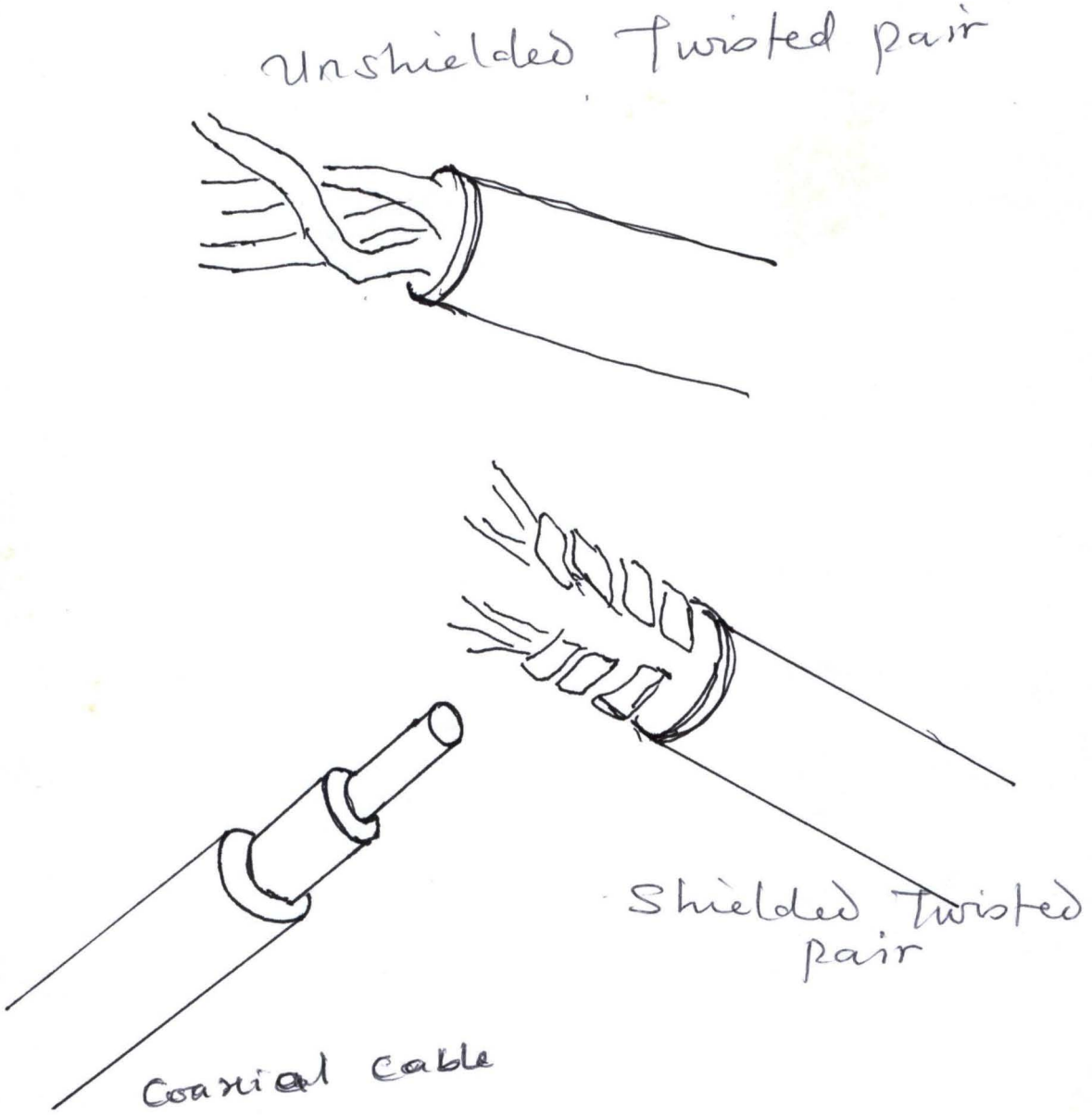

Unshielded Twisted pair
Shielded Twisted pair
Coaxial cable

Fig. 1.6

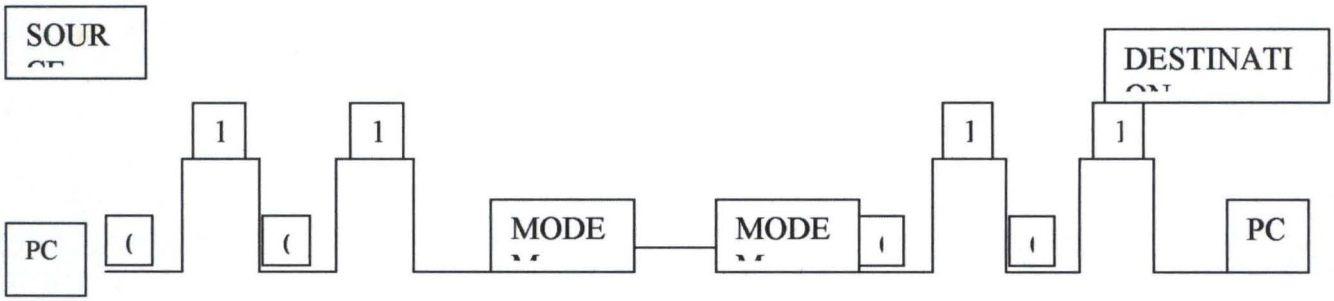
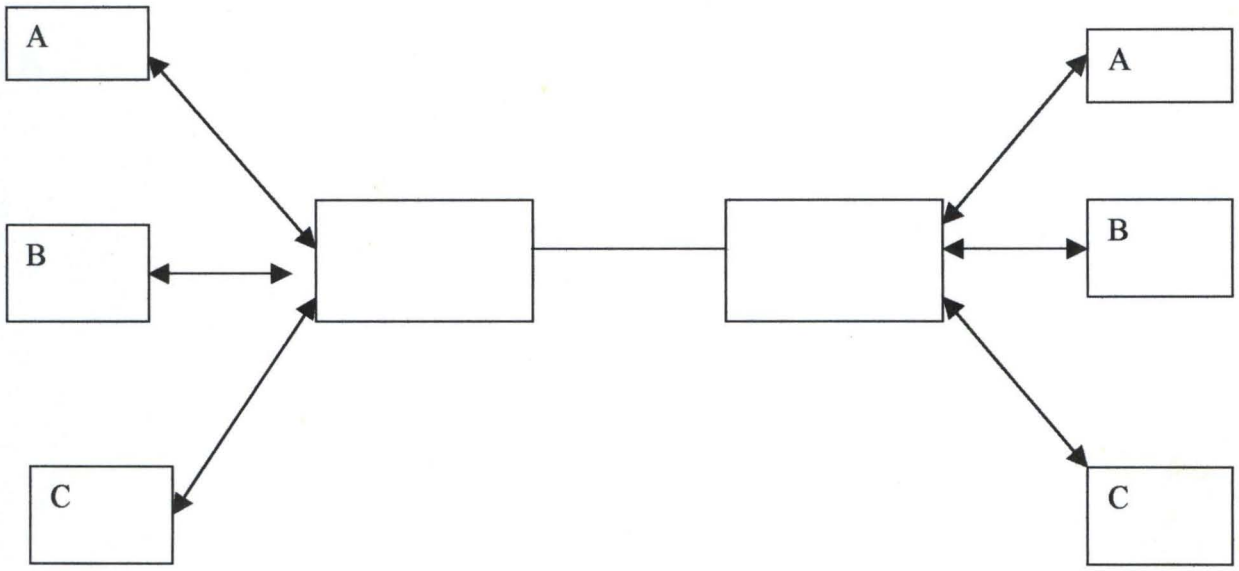


Fig 1.8 modem



Multiplexer Fig 1.9