NATIONAL OPEN UNIVERSITY OF NIGERIA

CIT 701

Foundation of Information & Communication Technology

Module 3

CIT 701 Foundation of Information and Communication Technology Module 3

Course Developer/Writer
Musa Abraham Abaka, Kaduna State University

Course Editor
Dr. Adesina S. Sodiya, University of Agriculture Abeokuta

Course Coordinator
Dr. Greg Onwodi, National Open University of Nigeria

Programme Leader
Prof. Monioluwa Olaniyi, National Open University of Nigeria

Credits of cover-photo: Henry Ude, National Open University of Nigeria

National Open University of Nigeria - 91, Cadastral Zone, Nnamdi Azikiwe Express Way, Jabi, Abuja, Nigeria

www.nou.edu.ng centralinfo@nou.edu.ng
oer.nou.edu.ng oerunit@noun.edu.ng OER repository

Published in 2021 by the National Open University of Nigeria

How to re-use and attribute this content

Module 3 Distributed Networks and the Internet

Unit 1 Communications Networks

1.0 Introduction

In the previous unit, you were introduced to computer networks. This unit will expand the computer networks to communication networks by adding communication channels.

2.0 Objectives

At the end of this unit, you should be able to:

- state the principles of communication networks
- identify the various types of network service applications
- state the various network channels with examples
- identify the five transport technologies that are widely use in physical channel networks.

3.0 Main Content

A communication network is a set of locations, or nodes, consisting of hardware, programs, and information that are linked together as a system that transmit and receives data and information.

3.1 Principles of Communications Networks

Communication: The sending and receiving of data and information over a communications network.

Multiuser System: A communications system in which more than one user share hardware, programs, information, people, and procedures.

3.2 Roles of Communications Networks

Communications Network: A set of locations, or nodes, consisting of hardware, programs, and information linked together as a system that transmits and receives data and information.

Node: A communication station within a network.

3.3 Network Service Applications

Network services are the applications available on a communications network.

Electronic Mail: Sometime called e-mail are designed to overcome the communication barrier created by time and distance over a phone. E-mail is a service that transports text messages from a sender to one or more receivers.

Electronic Mailbox: An area of space on magnetic disk in a server or host computer that is allocated for storing an individual's e-mail.

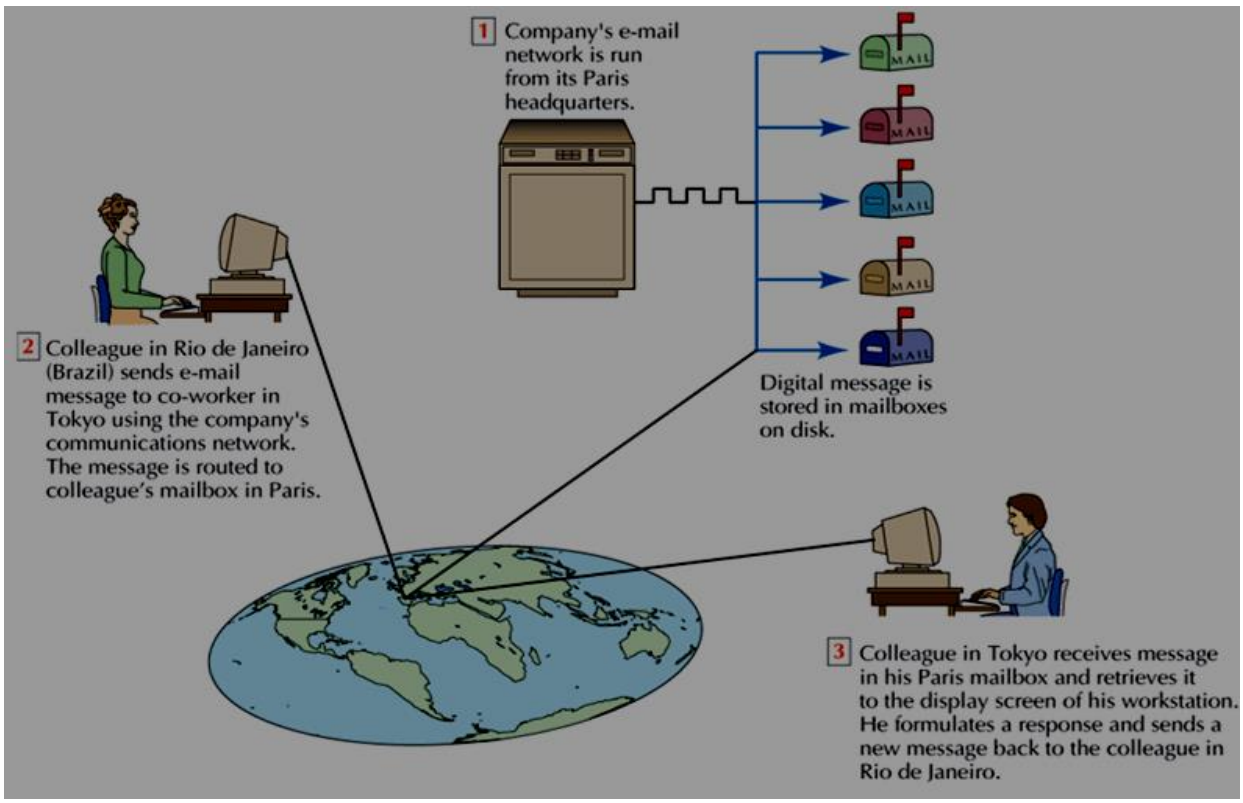

Fig. 13.1: E**-mail Network and Mailboxes**

Source: Senn (2004)

Voice Mail: A system that captures, stores, and transmits spoken messages using an ordinary telephone connected to a computer network.

Ppts (Post, Telephone, and Telegraph Companies): A general term for telephone companies outside the United States.

Unified Messaging Systems: Offers users the ability to manage several communications media, including telephone, fax, e-mail (including those from the Web), and voice mail through a central message manager.

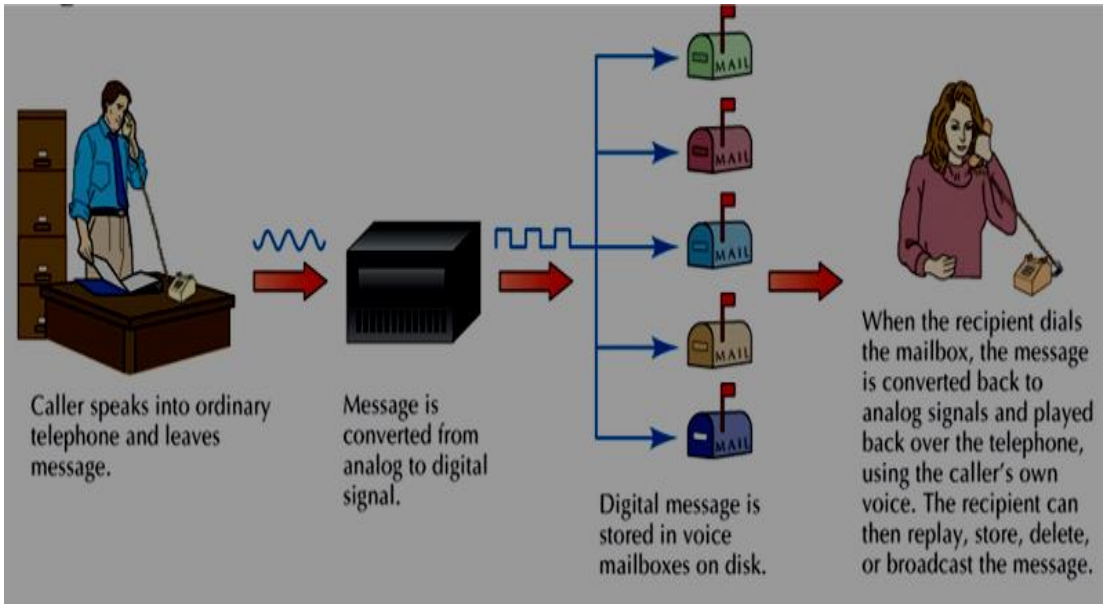

Fig. 13.2: How Voice Mail Works

Source: Senn (2004)

Videoconferencing: A type of conferencing in which video cameras and microphones capture the sight and sound of participants for transmission over a network.

Webcasting: Uses the reach of the Internet to link people from anywhere in the world into a conference.

Work Group Conferencing: A type of conferencing that uses a software package called groupware to interconnect participants' computers at their various locations. Participants interact through a microcomputer directly linked to a server and their comments are broadcast to all others taking part in the conference.

Electronic Bulletin Board: A network service application that allows messages and announcements to be posted and read. It is accessed by dialing a telephone number and interconnecting with the bulletin board through a modem.

Electronic Funds Transfer (EFT): The movement of money over a network.

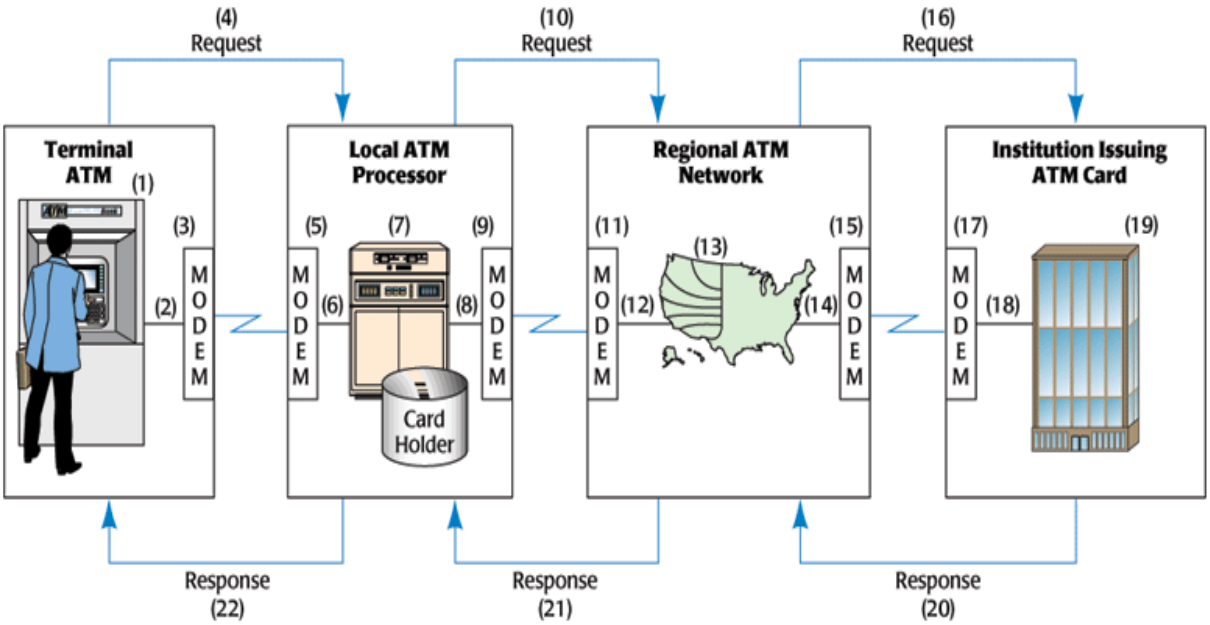

Fig. 13.3: ATM Networks Link Regional, National, and International Banks
(Source: Senn (2004))

Electronic Data Interchange (EDI): A form of electronic communication that allows trading partners to exchange business transaction data in structured formats that can be processed by application software.

Videotex: A two-way, interactive, text-only service operating on mainframe computers that combines a video screen with easy-to-follow instructions.

3.4 Network Channels

Communications channel/communications medium is the physical or wireless media that link the different components of a network.

Physical Channels

a. Twisted Pair**:** A physical communications channel that uses strands of copper wire twisted together in pairs to form a telephone wire.

b. Coaxial Cable/Co-ax**:** A physical communications channel that uses one or more central wire conductors surrounded by an insulator and encased in either a wire mesh or metal sheathing.

c. Coaxial Cable/Co-ax**:**

- Baseband Cable**:** Carries a single communication or message at very high megabit speeds, is often used in local area networks.

- Broadband Cable**:** Carries multiple signals – data, voice, and video – simultaneously; each signal can be a different speed.

Fibre-optic Cable**:** A physical communications channel that uses light and glass fibres.

Wireless Channels

Wireless channels transmit data using radio signals sent through air or space rather than over wire or optical cables.

Microwave: A wireless medium that uses high-frequency radio signals to send data or information through the air.

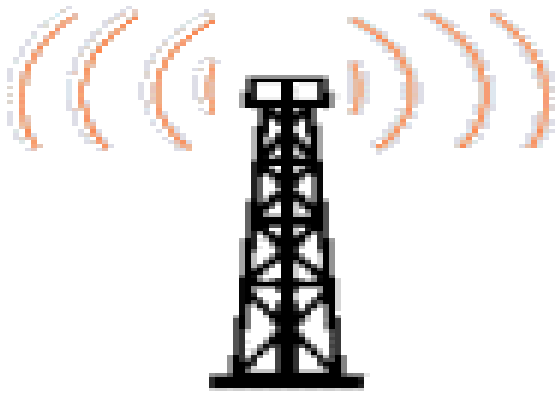

Fig. 13..4: A Microwave Station

(Source: Smith, 2009)

Satellite: A wireless medium in which communications are beamed from a microwave station to a communications satellite to orbit above the earth and relayed to other earth stations.

- Low-earth-orbit satellite (LEO)**:** Because they circle the earth at a distance far closer than other satellites, LEO satellite systems offer significant advantages: they do not have the comparatively long propagation delays, do not require use of bulky, expensive, directional antennas, less expensive to produce and to launch into orbit. However, greater numbers are needed to provide coverage for a geographical area because they do orbit closer to earth.

- Very Small Aperture Terminal (VSAT)**:** A satellite earth station with an antenna diametre less than one metre.

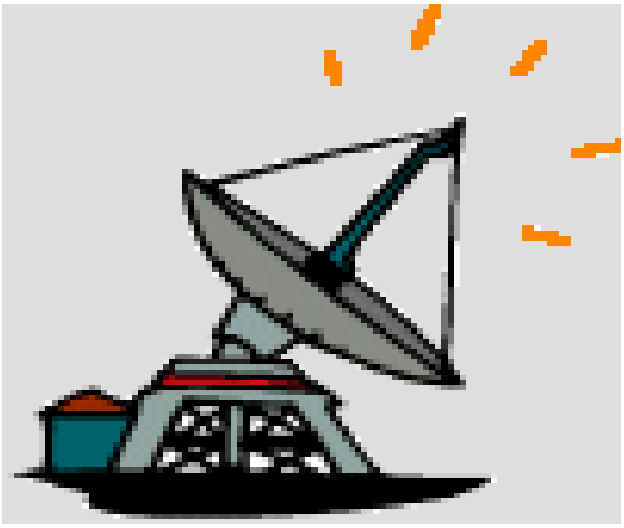

Fig. 13.5: A Very Small Aperture Terminal (VSAT)

Source**:** Smith ,2009

Infrared: A wireless medium that transmits data and information in coded form by means of an infrared light beamed from one transceiver to another.

Transceiver**:** A combination transmitter and receiver that transmits and receives data and information.

Radio Waves

Radio Wave Transmission/Radio Frequency (RF) Transmission: A wireless medium that uses frequencies rented from public radio networks to transmit data and information.

3.5 Communication Channels for WANS, MAN and LANS

Public Access Networks*:* A network maintained by common carriers for use by the general public.

1. Switched Network/Circuit Switched**:** The complete set of public access networks, so named because the telephone company operates and maintains the switching centres that make it possible to transmit data and information.

2. Packet Switching**:** A network communication method in which messages are divided into packets. Each packet is then transmitted individually and can even follow different routes to its destination.

3. Packet: A piece or section of a transmitted message that contains both data and address information enabling the network to deliver the packet to its intended destination.

Private Network*:* A network made up for leased (dedicated) communications lines.

Leased Line/Dedicated Line**:** A communications line reserved from a carrier by a company for its exclusive use.

Value-added Network (VAN): A public data communications network that provides basic transmission facilities plus enhancements (e.g. temporary data storage and error detection).

Connecting to the Channel

The devices used as channels to connect to networks are:

Modem: A device that connects a computer to a communications medium and translates the data or information from the computer into a form that can be transmitted over the channel. Used in WANs.

Multiplexer: A device that converts data from digital to analog form and vice versa in order to allow a single communications channel to carry simultaneous data transmissions from the many terminals that are sharing the channel.

Network Interface Card (NIC): A circuit board used in LANs to transmit digital data or information.

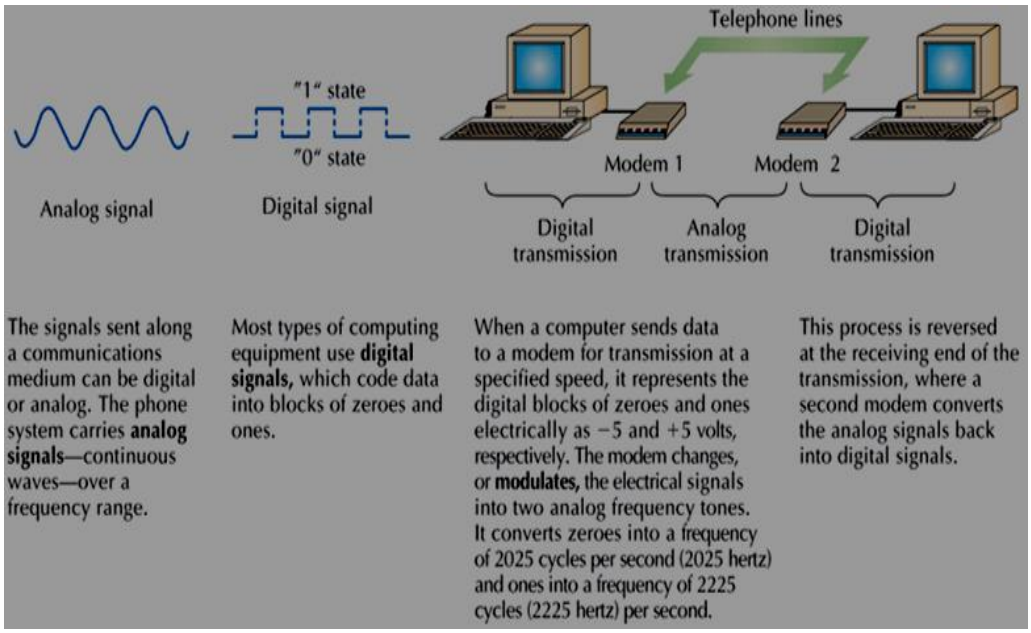

Fig. 13.6: Converting Digital Signal to Analog Signal Using a Modem

Source**:** Senn (2004)

Interconnecting Networks

Bridge/Router: A device that interconnects compatible LANs.

Gateway: A device that connects two otherwise incompatible networks, network nodes, or devices.

Extending Networks

- Microwave/RF Radios
- Switch
- Hub

3.6 Physical Network Transport Technology

Five Types of Transport Technology

Frame Relay: A way of sending data over a wide area network in which data are divided into frames (i.e., packets) with each containing an address that the switched network uses to determine its destination.

Asynchronous Transfer Mode (ATM): A data transmission method using switched networks in which a message containing data, voice, or video is divided into fixed length cells.

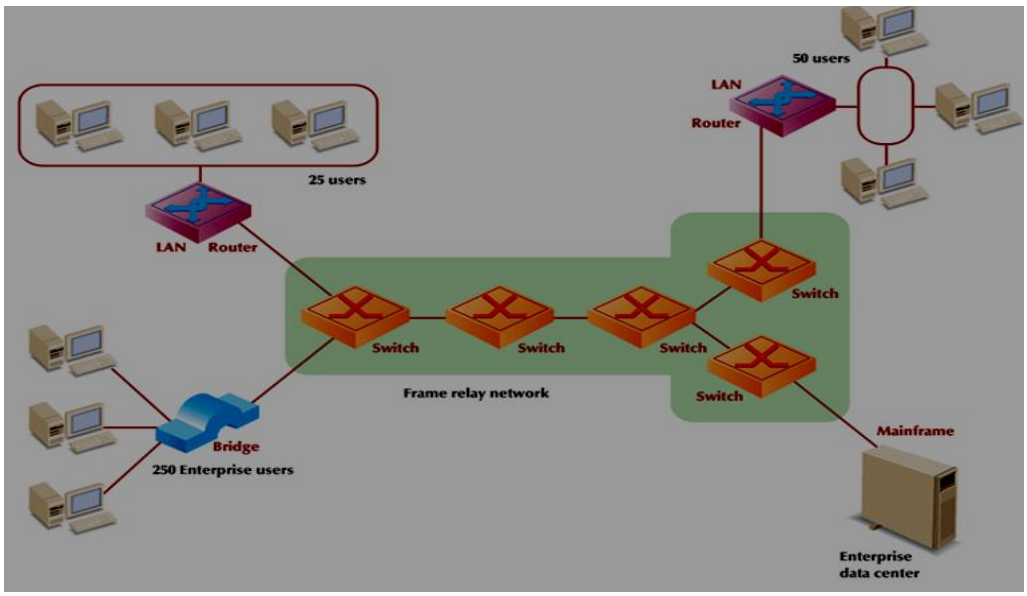

Fig. 13.7: Frame Relay Network

Source: Senn (2004)

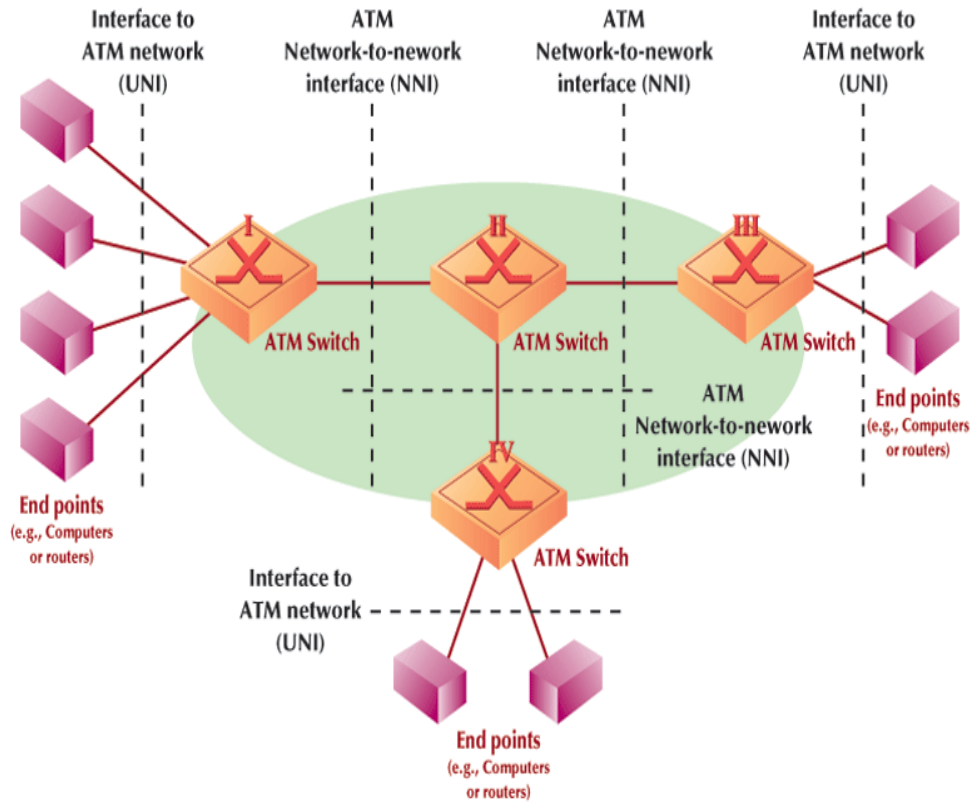

Fig. 13.8: Asynchronous Transfer Mode (ATM)

Source: Senn (2004)

Digital Subscriber Line (DSL)*:* Offers high-speed data access over the single pair of the ordinary copper lines used with basic voice-grade telephone service.

Asymmetric Digital Subscriber Line (ADSL)*:* The most commonly used form of high speed digital subscriber line (DSL) Internet access characterized by higher receiving (upstream) transmission rates compared to sending (downstream) transmissions.

Very High Speed DSL (VDSL)*:* Provides transport of data over copper twisted pair lines at even higher speeds, ranging from 13 mbps to 55 mbps.

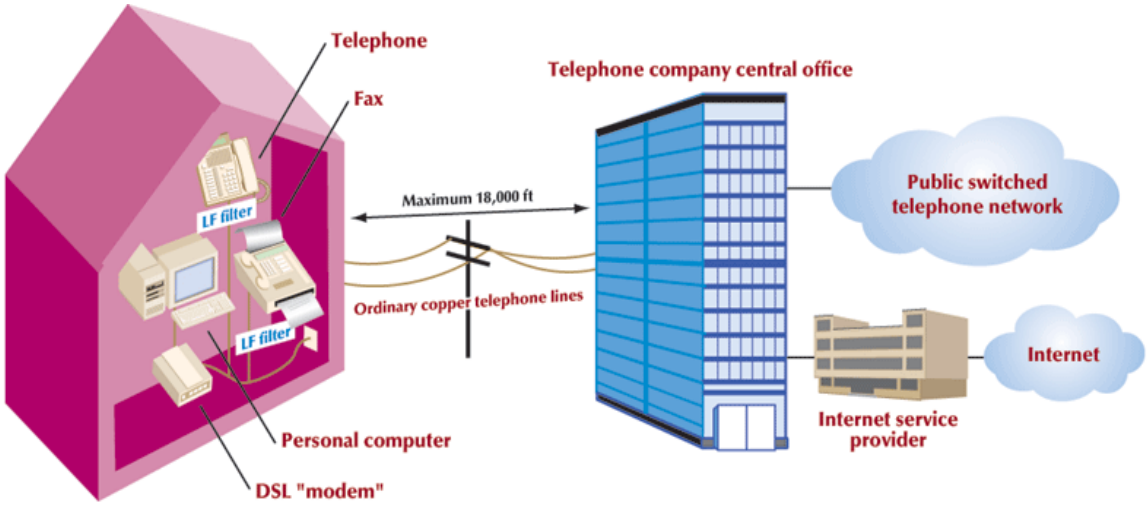

Fig. 13.9: A digital subscriber line provides high-speed data transmission over ordinary copper telephone lines

Source: Senn (2004)

Integrated Services Digital Network (ISDN): A next generation telephone system integrating voice and data onto one line and capable of transporting digital data over analog lines.

Switched Multimegabit Data Services (SMDS): A high-speed, packet-switched transport technology that can operate over copper or fibre channels.

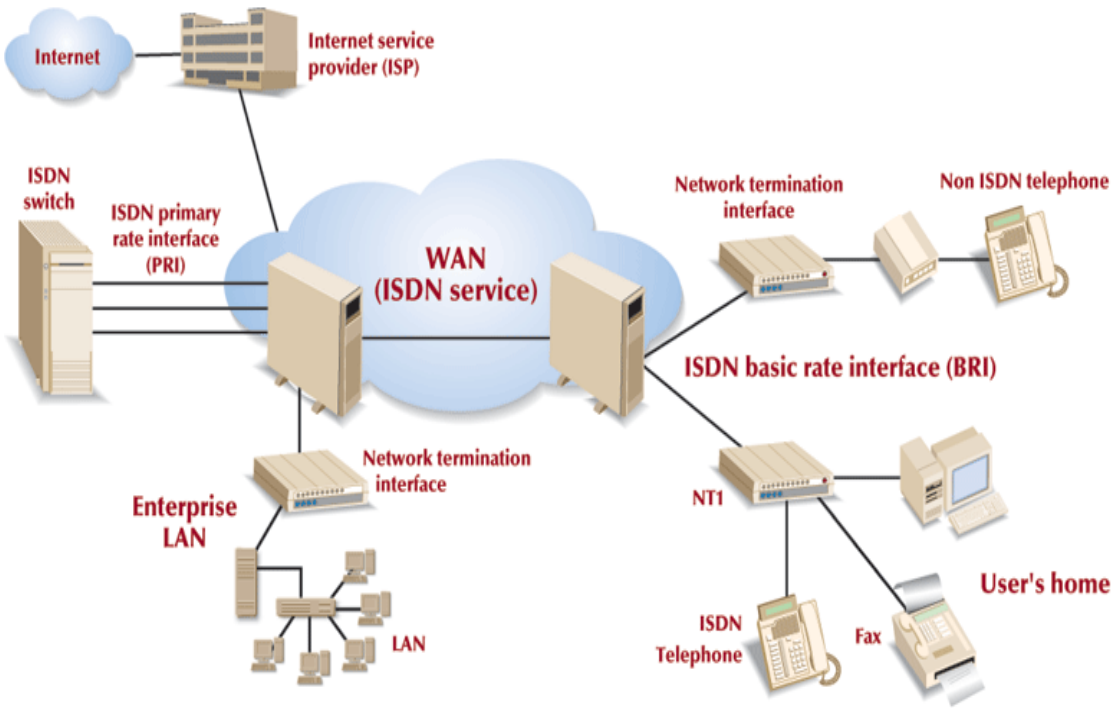

Fig. 13.10: Integrated Services Digital Network

Source: Senn (2004)

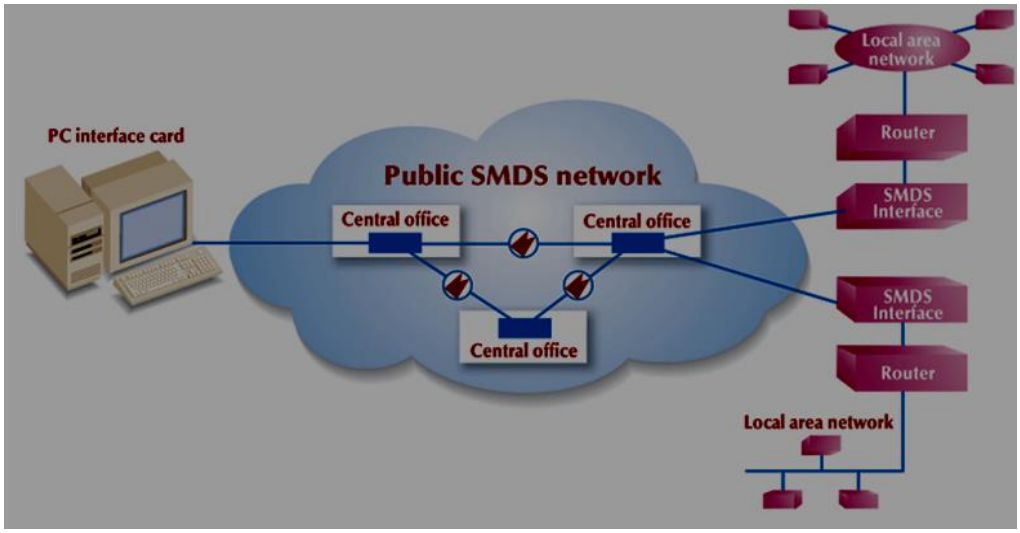

Fig. 13.11: Switched Multimegabit Data Service

Source: Senn (2004)

4.0 Conclusion

A communications channel/medium is used to physically or wireless link the different component of a communication networks for the benefit of sharing various network service applications (e-mail, e-conference, e-transfer).

5.0 Summary

In this unit, you learnt that a communications network is made up of:

- Interconnecting networks - using a router, bridge and gateway.
- Extended networks - using microwave/RF radio, switch and hub.
- Physical channels using twisted pair, co-ax and fibre-optic cable.
- Wireless channels using microwave, satellite, radio frequency transmission.

6.0 Self-Assessment Exercise

1. What is a communications network?
2. List three network service applications you know.
3. What do you understand by the term network channels?
4. List the five types of transport technology you know.

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.).United States of America: Glencoe/McGraw-Hill.

O'Leary, T.J. & O'Leary, L. I. (2004). *Computing Today*. New York, US: McGraw-Hill.

Senn, J. A. (2004). *Information Technology: Principles, Practices, Opportunities.* (3rd ed.). New Jersey, US: Pearson Prentice Hall.

Smith, J. (2009). *Jan's Web Work and Experiments*. Retrieved August 15, 2009, from http://www.jegsworks.com.

Unit 2 Enterprise and Wireless Communications Networks

1.0 Introduction

Unit 1 introduced you to communication networks. In this unit, you will learn more about the wireless communications networks and the enterprise (organisations).

2.0 Objectives

At the end of this unit, you should be able to:

- describe the four forms of wireless communications
- explain the role of a network operating system
- discuss the activities involved in network administration
- explain the three types of enterprise architectures and the advantages offered by each.

3.0 Main Content

3.1 Wireless Communications Networks

Wireless communications have gained a lot of interest for a wide range of ICT applications. The four wireless forms of interest are:

- cellular communications service
- wireless LAN (WLAN)
- Bluetooth personal area network/personal area network
- wireless data networks.

Cellular Communications Service

Cellular Communications Service

A wireless technology that transmits radio messages between a mobile device (such as mobile telephone, PDA, or wireless laptop) and a cell site.

Cellular Radio System

Mobile Telecommunications Switching Office (MTSO): The switch used in a cellular (mobile) telephone system that links the cell tower to a traditional telephone switch in the public switched telephone network (PSTN).

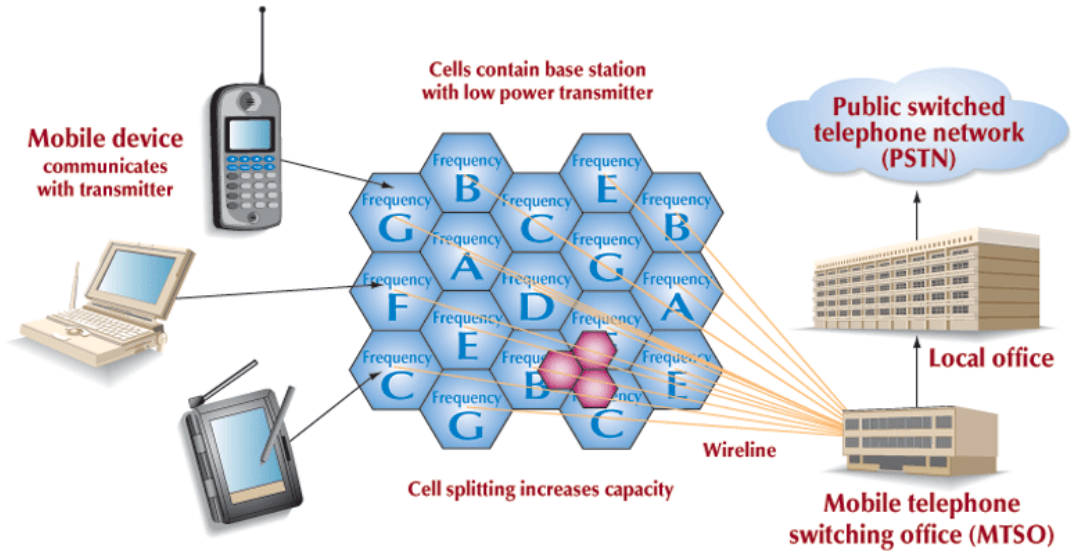

Fig. 14.1: A Cellular Radio System

Source**:** Senn (2004)

Analog and Digital Cellular Service

Time Division Multiple Access (TDMA***):*** A digital cellular transmission technology that divides a radio frequency into time slots and then allocates slots to an individual device's conversation or message, thereby distinguishing it from other transmissions.

Code Division Multiple Access (CDMA*):* A digital cellular transmission technology that encodes each device's conversation or message with a unique identification code to distinguish it from other transmissions.

Next Generation Cellular Service

Generalised Packet Radio Service (GPRS): GPRS (or 2.5G) features higher speed transmission rates than preceding telecom generations and uses packet switching rather than circuit switching, to transmit messages.

Third-Generation Service (3G): Uses packet switching and transmits at higher bandwidths that provide faster downloads of information – rates ranging from 384 Kbs to 2 Mbs, depending on the location of the user.

Global Positioning System (GPS): A satellite navigation system and a worldwide navigation system that uses information received from orbiting satellites.

Wireless LAN (WLAN)

It is the local area networks that transmit data using radio frequencies instead of cables.

Components of WLAN

Access Point: A device that converts wired LAN signals into radio frequency.

802.11 Wireless Ethernet

Wireless LAN Security

- Wired Equivalent Privacy (WEP): A system of security protection that is a standard for encrypting data (converting the data into a protective code) over an 802.11 b wireless network.

- Service Set Identity (SSID)**:** An encrypted code keyed into the LAN devices, so that only devices with similar code can access the network resources.

Bluetooth Personal Area Network/Personal Area Network

A wireless technology for communicating between devices that enable short-range radio links (30 feet or 10 metres) between devices, such as between a PC and a laptop, or a PDA and a printer.

Wireless Data Networks

Wireless Data Networks (WDNs)*:* Networks that use cellular communications services to support mobile users seeking to interconnect with networks using wireless laptops and PDAs.

Virtual Private Network (VPN): A network constructed of public channels to connect client computers to server, incorporating encryption and other security mechanisms to ensure that only authorised users can gain access and that the data cannot be intercepted

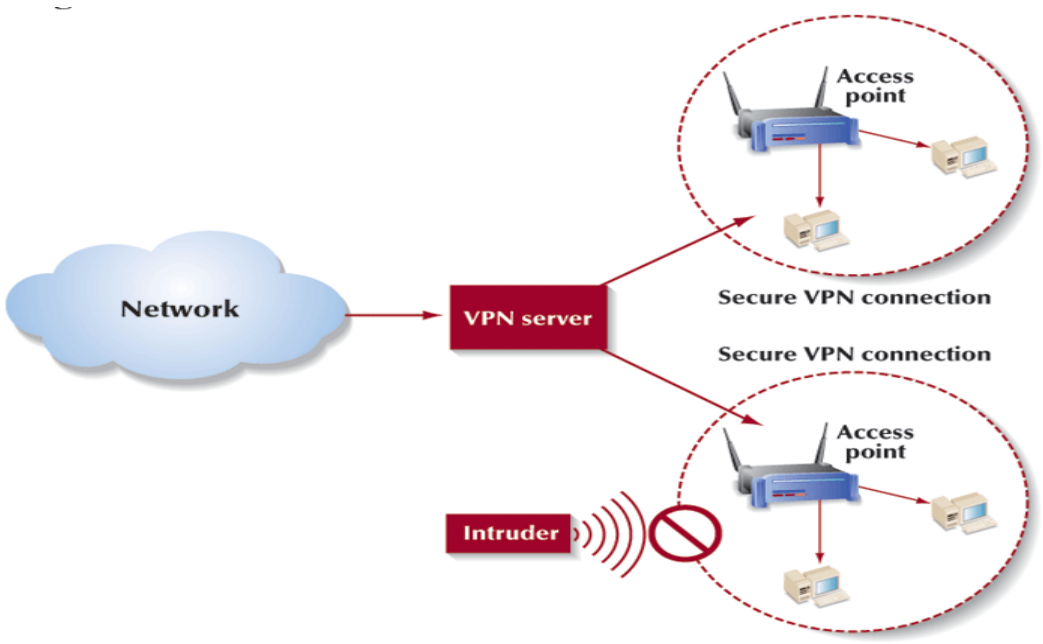

Fig. 14 .2: A Virtual Private Network Architecture

Source**:** Senn (2004)

3.2 Network Operating Systems

It is a software program that runs in conjunction with the computer's operating system and applications programs and manages the network.

Protocol: Is the rules and conventions guiding data communications, embedded as coded instructions in the network software.

Network Administration/Network Management: The management of a network, consisting of those procedures and services that keep the network running properly. The ICT professional responsible for this job is called a Network Administrator.

3.3 Enterprise Architectures

Architecture: Is the structure of a communications network, which determines how the various components of the network are structured, how they interact, and when cooperation between the system's components is needed.

Centralised Architecture: A communications architecture in which a computer at a central site hosts all of the network's hardware and software, performs all of the processing, and manages the network.

Host-based Computing: It is a centralised computing.

Teleprocessing: The processing capability made possible by connecting desktop computers to a remote computer through telephone lines.

Front-End Computer: In a centralised system, a minicomputer loaded with specific programs to handle all incoming and outgoing communications traffic.

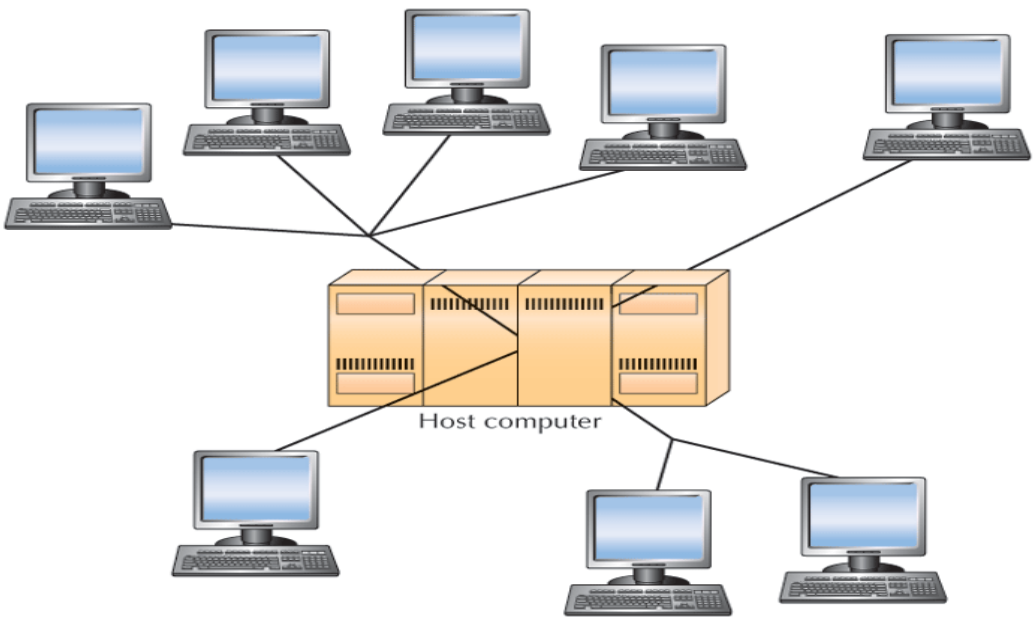

Fig. 14 .3: A Centralised Architecture

Source: Senn (2004)

Distributed Architecture; It is a communications architecture in which the computers reside at different locations and are interconnected by a communications network.

Distributed Processing; It is a processing in which an application runs on one or more locations of the network simultaneously.

Distributed Database; It is a database that resides in more than one system in a distributed network. Each component of the database can be retrieved from any node in the network.

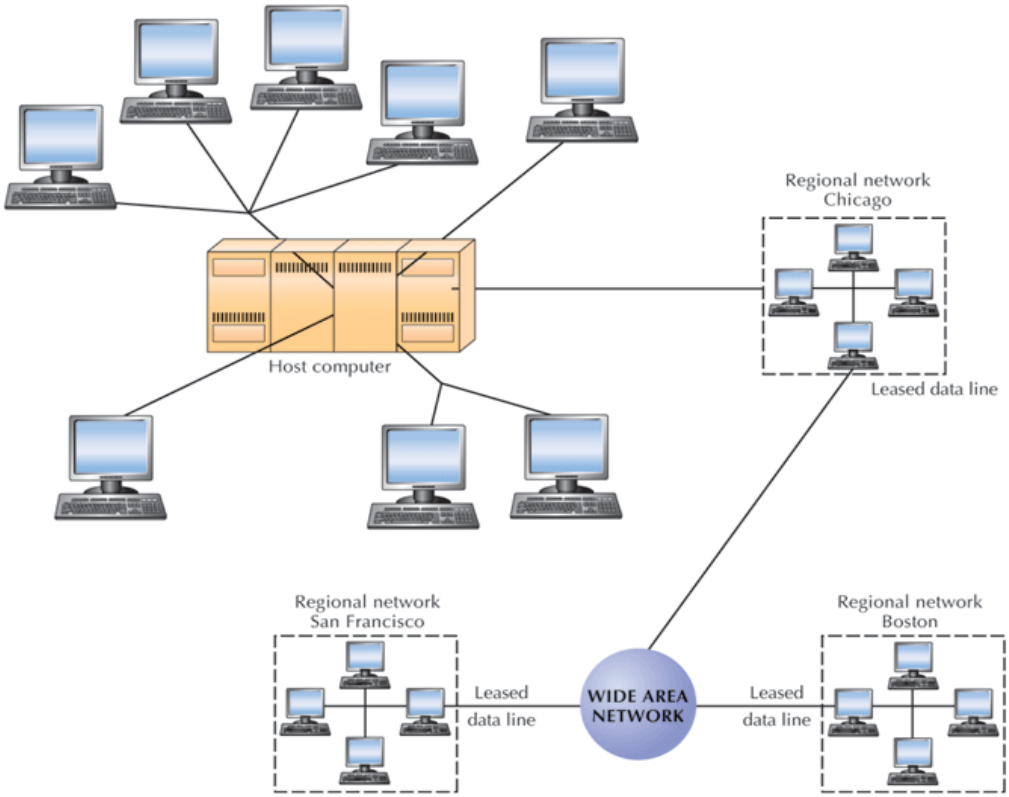

Fig. 14 .4: A **Distributed Architecture with Distributed Processing**

Source: Senn (2004)

Combined Architectures

Hybrid Network*:* A communications architecture that combines centralised and distributed architectures to take advantage of the strengths of both.

Virtual Company*:* A company that joins with another company operationally, but not physically, to design and manufacture a product.

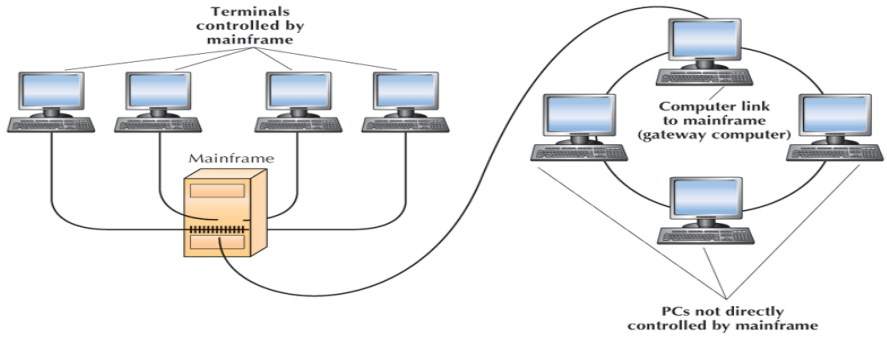

Fig. 14.5: Hybrid Architecture

Source**:** Senn (2004)

4.0 Conclusion

Wireless communications networks are mostly used to implement enterprise networks, because it is easier and faster to connect branch offices at different cities over a wide distance to share resources.

5.0 Summary

In this unit you, learnt about:

- four types of wireless communications networks(cellular communications service, wireless LAN, Bluetooth personal area network/personal area network, wireless data networks
- three types of enterprise architectures(centralised architecture, distributed architecture combining architectures).

6.0 Self-Assessment Exercises

1. What is security in WLAN.
2. List the four types of wireless communication networks.
3. Who is a Network Administrator?
4. How many types of enterprise architectures do you know?

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

O'Leary, T.J. & O'Leary, L. I. (2004). *Computing Today*. New York, US: McGraw-Hill.

Senn, J. A. (2004). *Information Technology: Principles, Practices, Opportunities.* (3rd ed.). New Jersey, US: Pearson Prentice Hall.

Unit 3 Essentials of the Internet

1.0 Introduction

In units 1 and 2 of this module, you learnt about enterprise and personal communications networks. In this unit, you would use these networks to implement the Internet. The internet is a giant highway that connects you to millions of other people and organisations located throughout the world. It is considered to be the most important technology of the 21st century.

2.0 Objectives

At the end of this unit, you should be able to:

- discuss the origin and uses of the Internet
- describe the three types of capabilities of the Internet
- identify the principal communication and retrieval capabilities of the Internet
- differentiate between Intranets, Extranets and Internet.

3.0 Main Content

A network is a communications system connecting two or more computers. Networks connect people as close as the next office and as far away as halfway around the world. The largest network in the world is the Internet. It is a huge computer network available to nearly everyone with a microcomputer and a means to connect to it.

3.1 The Internet

The internet is often referred to as the information superhighway; it is like a highway that connects you to millions of other people and organisations. Unlike typical high ways that move people and things from one place to another, the Internet moves your ideas and information. Rather than moving through geographic space, you move through cyberspace- the space of electronic movement of ideas and information.

3.1.1 Basic Concepts

Connectivity

Connectivity is the capability of your microcomputer to share information with other computers. Data and information can be sent over telephone lines or cable and through air. This means that, your microcomputer can be connected to other computers, to the Internet, and to many computerised data banks and other sources of information worldwide.

The most dramatic change in connectivity in the past decade has been the widespread use of mobile and wireless communication devices. It was used in the past for telephone

communications, these devices are widely used to connect people and computers located almost anywhere in the world.

Wireless Revolution

The telephone, mobile and wireless communication systems are the beginning of wireless revolution, a revolution that is expected to dramatically affect the way we communicate and use computer technology. Connectivity and the wireless revolution are significant developments, for they expand the uses of the microcomputer several fold. Central to the concept of connectivity is the network or computer network.

3.2 The Origins of the Internet

The Internet, or the Net, was launched in 1969 when the United States funded a project that developed a national computer network called Advanced Research Agency Network (ARPANET). The Internet is a large network that connects smaller networks all over the globe together.

3.3 Computers on the Internet

Client Computer: The computer that accesses the information stored on a server computer.

Server Computer: The computer that contains data and information that can be accessed by a client computer.

Client-Server Computing: A type of computing in which all data and information retrieval requests and responses pass over a network. Much of the processing is performed on the server and the results of the processing are transmitted to the client.

Surf or Surfing: Moving among a number of networks that are linked together, or inter-networked.

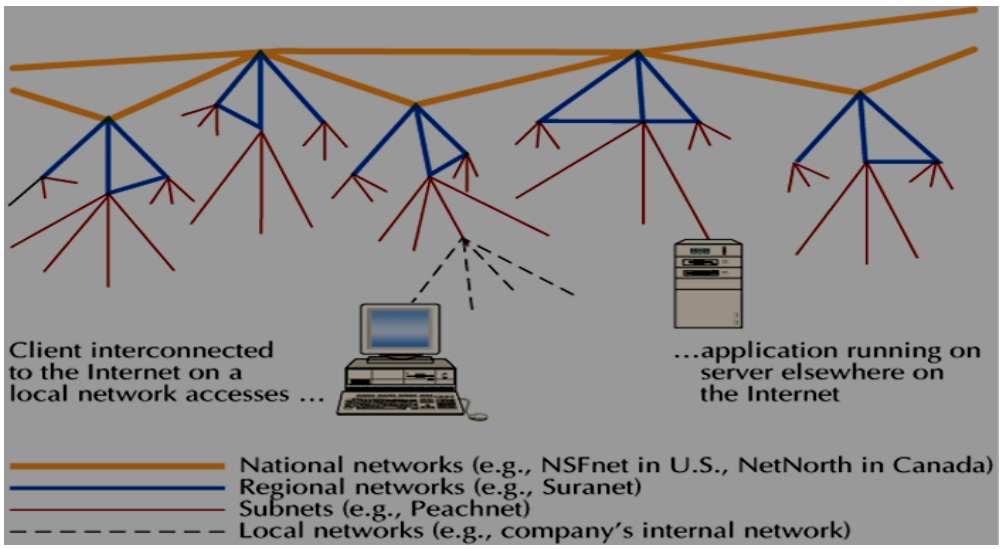

Fig. 15 .1: Structure of the Internet

Source: Senn, (2004)

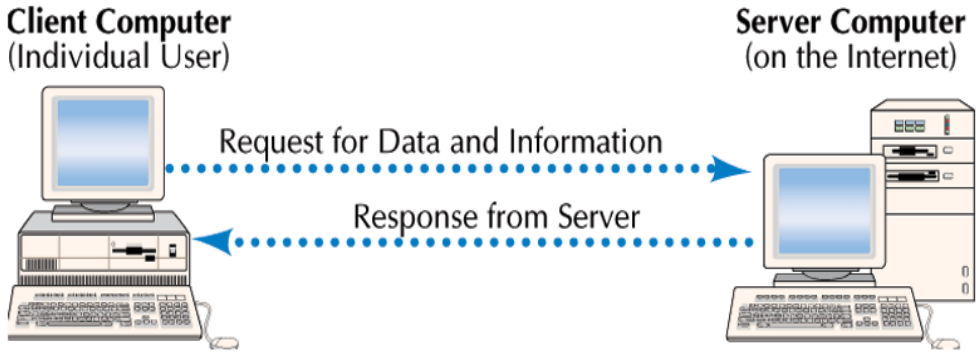

Fig.15 .2: Client / Server Computing

Source: Senn (2004)

3.4 Capabilities of the Internet

The Internet is used by billions of users in different countries in the world to perform the following activities;

- communicate
- retrieve
- research on the Web
- shopping on cybermalls

Communications Capabilities

E-mail or Electronic Mail: A service that transports text messages from a sender to one or more receivers via computer.

Mailing Lists: Each mailing list has subscribers who receive messages as part of an ongoing discussion of the list's topic.

Moderated: A mailing list in which the messages are first screened by an individual to determine their suitability given the purpose of the list.

Newsgroups: Worldwide discussion areas where notices can be posted for anyone to view.

Usenet or User's Network: A system of worldwide discussion groups, not an actual physical network.

Netiquette: A list of simple newsgroup guidelines that keep people from making mistakes.

Chat Session or Internet Relay Chat (IRC): A live interactive discussion in which parties on the network exchange ideas and observation electronically.

Portal: A gateway or hub site, such as Yahoo!, that provides chat rooms.

Instant Messages: A combination of real-time chat and e-mail by which short text messages are rapidly exchanged over the Internet, with messages appearing on recipient's display screen immediately upon arrival.

Internet Telephony or Voice over the Internet or Voice over IP**:** Real-time voice conversations transmitted between computers on the Internet.

Telnet: A network capability that permits remote sign-on to any computer on the Internet from the computer an individual is using at that time.

Retrieval Capabilities

FTP (File Transfer Protocol): Used for transferring files containing documents or software between computers on the Internet.

Web Directory: A listing of Web sites and their URLs, categorised by topic.

Keyword: A string of letters or words that indicates the subject to be searched.

Search Engines: Software programs that look through the Web to locate sites matching a keyword entered by the user. They provide two different search approaches: keyword and directory search. Examples include Yahoo, Google, Alta Vista, Ask, My Search, and others.

Metasearch Engines: The metasearch engine receives the results, eliminates duplicates, orders the hits, and then provides edited list for you. Metacrawler is an example of metasearch engine.

Specialised Search Engines: This focused on subject specific Web sites (www.invisibleweb.net), they save time by narrowing the search. When researching for information on production or engineering. You could begin with a general search engine like Google or go directly to howstuffworks.com.

Portal: A gateway or hub on the Internet from which other sites can be visited.

Vertical Portal or Vortal: A Web site that specialises in providing information related to a particular industry such as automobiles, healthcare, or investments.

Horizontal Portal: Provides services and links to Web sites of interest to a wide variety of users.

Webcasting: The pre-arranged delivery, or push, of information of interest to a user's desktop automatically.

Pull: To get something from a Web site by clicking on a link or entering a URL.

Push*:* The capability of a Web site for automatic Internet delivery of information, including software updates, to a user's desktop.

Channel: A Web site designed to push information to a user's desktop.

Streaming: An on-demand retrieval and playing of audio, video, or other media that can occur while the downloading is occurring.

Research on the Web

The Web being an invaluable research tool for materials to write thesis, has three basic

Procedures: locating information, evaluating the information and citing references.

Locating Information

With all the numerous information available on the Web, it is very difficult for you to locate the right material you are looking for. Discussion groups (www.liszt.com) that can link you to experts are being overlooked.

Evaluating Information

Ii is not everything you find on the Web that is useful, nearly anyone can publish anything. Care is to be taken when considering the quality of information by considering a few questions, like, who put the information there and what are the sources. For example if the site is maintained by a university, college, or government agency, the information is likely to be more reliable than information from an unknown individual.

Citing References

Plagiarism is the illegal copying of someone else's words or ideas. You can use someone's words or ideas without committing plagiarism by simply acknowledging or citing the source.

Author Name, day month year, <sources>

Binta Musa, 22 December 2008,http://www.billytuks.com

This citation acknowledges information created by Binta Musa (author) that was obtained on December 22, 2008, from http://www.billytuks.com Web site <source>. If the authors name is unknown the title of the Web page would replace the author's name.

Shopping or Cybermalls

Electronic Commerce/e-commerce: Conducting commercial activities on the Internet (see details in unit 5 of module 3).

3.5 The Internet Community

The way you connect a phone to a telephone system that is how you connect a computer to the Internet. The computer becomes an extension of a giant network of computers with branches all over the world that allow the use of a browser program to the Web.

Internet Users: Individuals, organisations, schools, hospitals, e.t.c

Providers: The providers or host computers provide a path or connection for individuals to access the Internet. The National Open University of Nigeria (NOUN) most likely

provides free Internet access to staff and students either through their local area network or a dial-up or telephone connection. They provide connection to the users through the following technologies including dial-up, DSL, cable, and wireless modems.

The following are companies that act as providers in different capacities:

Service Providers or Internet Service Providers (ISPs*):* companies that sell communication services which enable users to access the Internet.

National Services Providers*:* through standard telephone connections users can access the internet from almost anywhere within the country for a standard fee without incurring long distance telephone charges. They are Nigerian Telecommunication (NITEL), American Online (AOL) and GSM companies.

Regional Services Providers*:* they also use telephone lines known and also fixed wireless system, but the coverage is not as wide as the national service providers. They cover several states. If the user accesses the internet from outside the regional area they incur long distance connection charges in addition to the service's standard fees. Intercellular, Multilinks, Starcoms, Visafone, e.t.c are examples.

Wireless Services Providers: they do not use telephone lines but rather use microwave radio, Vsat and other satellite technologies. They provide connections for computers with wireless modems and a wide array of wireless devices. They include Micro Access ltd, Linkserve, Propercom, IntelSat, Direct on Pc, GSM Companies, e.t.c.

Application Service Providers (ASPs): Companies that develop, install, and operate (or host) an information technology application on the Internet for the user, charging a recurring fee for doing so.

Content Providers: Individuals or companies that furnish the information available on the Internet.

Content: Information distributed over the Internet.

Infrastructure Providers

Network Infrastructure Providers*:* companies, such as telephone, cellular telephone, cable TV, and satellite transmission companies, which operate the network of communication channels that carry data and information to and from users and content locations.

Component Infrastructure Providers*:* companies that supply the computer hardware and software that makes it possible to use, operate, or store and retrieve content from the Internet.

Internet Support Agencies

Internet Corporation for Assigned Names and Numbers (ICANN): The non-profit corporation that was formed to assume responsibility for the IP address space allocation, protocol parametre assignment, domain name system management, and root server system management.

Internet Engineering Task Force (IETF): A large international community of network designers, operators, vendors, and researchers concerned with the evolution of Internet architecture and the smooth operation of the Internet.

3.6 Organisational Internet: Intranets and Extranets

Computer networks in organisations have evolved over time. Most large organisations have a complex and wide range of different network configurations, operating systems, and strategies. Integrating or connecting all of these has been very challenging task. One way is to apply Internet technologies to support communication within and between organisations using intranets and extranets.

Intranets

An intranet is a private network within an organisation that resembles the Internet. Like the public Internet, intranets use browsers, Web sites, and Web pages. Intranets typically provide e-mail, mailing list, newsgroup, and FTP services accessible only to those within the organisation.

Organisations use intranets to provide information to their employees. Typical applications include electronic telephone directories, e-mail addresses, employee benefit information, internal job openings, and much more. Employees find surfing their organisational intranets to be easy and as intuitive as surfing the Internet.

Extranets

An extranet is a private network that connects more than one organisation. Many organisations use Internet technologies to allow suppliers and others limited access to their networks. The purpose is to increase efficiency and reduce costs. For example, General Motors have thousands of suppliers for the parts that go into an automobile. By having access to the production schedules, suppliers can schedule and deliver parts as they are needed at the General motors assembly plant. General Motors can be assured of having adequate parts without maintaining large inventories.

4.0 Conclusion

The Internet is the actual physical network. It is made up of wires, cables, and satellites. Being connected to this network is often described as being online. The Internet connects to over 100 million computers and resources worldwide. The internet has changed the world into a global village.

5.0 Summary

You learnt in this unit that the Internet is:

- the world's largest network
- made up of a community of end-users and providers
- used to communicate, retrieve, research and shop online.

6.0 Self-Assessment Exercise

1. Identify the main functions of the Internet.
2. When was the Internet launched and by who?
3. What is the difference between e-mail, instant message, and chat session?
4. What is the difference between Intranets, Extranets and Internet?

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

O'Leary, T.J. & O'Leary, L. I. (2004). *Computing Today*. New York, US: McGraw-Hill.

Senn, J. A. (2004). *Information Technology: Principles, Practices, Opportunities.* (3rd ed.). New Jersey, US: Pearson Prentice Hall.

Unit 4 World Wide Web

1.0 Introduction

In the last unit, you learnt about the Internet changing the world into a global village. In this unit, you will learn how to use the Web; a multimedia interface to resources available on the Internet

2.0 Objectives

At the end of this unit, you should be able to:

- discuss the origin of the Web
- summarise how the Internet knows the location of a particular user
- explain the purpose of hyperlinks and their role on the Web
- describe the characteristics of browser software and relate them to the types of information that can be included in a home page.

3.0 Main Content

The web, also known as the World Wide Web or WWW or W^3, provides a multimedia interface to the numerous resources available on the Internet. The web provides an easy to use, exciting, multimedia interface to connect to the Internet and to access the resources available in cyberspace. It has become an everyday tool for all to use.

3.1 The Origins of the Web

The Web also known as the WWW and the World Wide Web was introduced in 1992 at the Centre for European Nuclear Research (CENR) in Switzerland. Prior to the Web, the Internet was all text (no graphics, animations, sound, or video). The Web made it easy to include these elements.

3.2 Internet Addresses

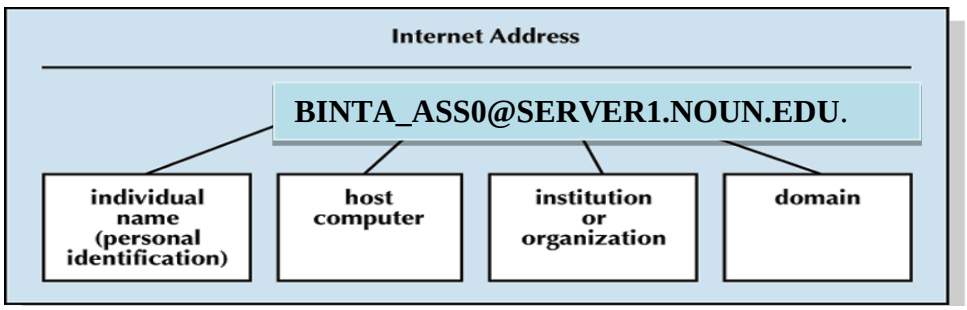

Fig. 16.1: Internet Address

Source: Senn (2004)

3.2.1 Domain Name System

Domain Name System (DNS): Computers have numeric addresses consisting of strings of numbers known as their Internet protocol (or IP) address.

Domain Name: The familiar, easy-to-remember names for computers on the Internet that correlate to assigned IP addresses.

Registry: A regional organisation that allocates Internet addresses to requestors in that region.

Registrars: Organisations delegated to accept and process Internet address applications and submit approved applications to the regional registrar.

Root Servers: One of 13 special computers distributed around the world that maintain the Internet addresses for all global and country registries.

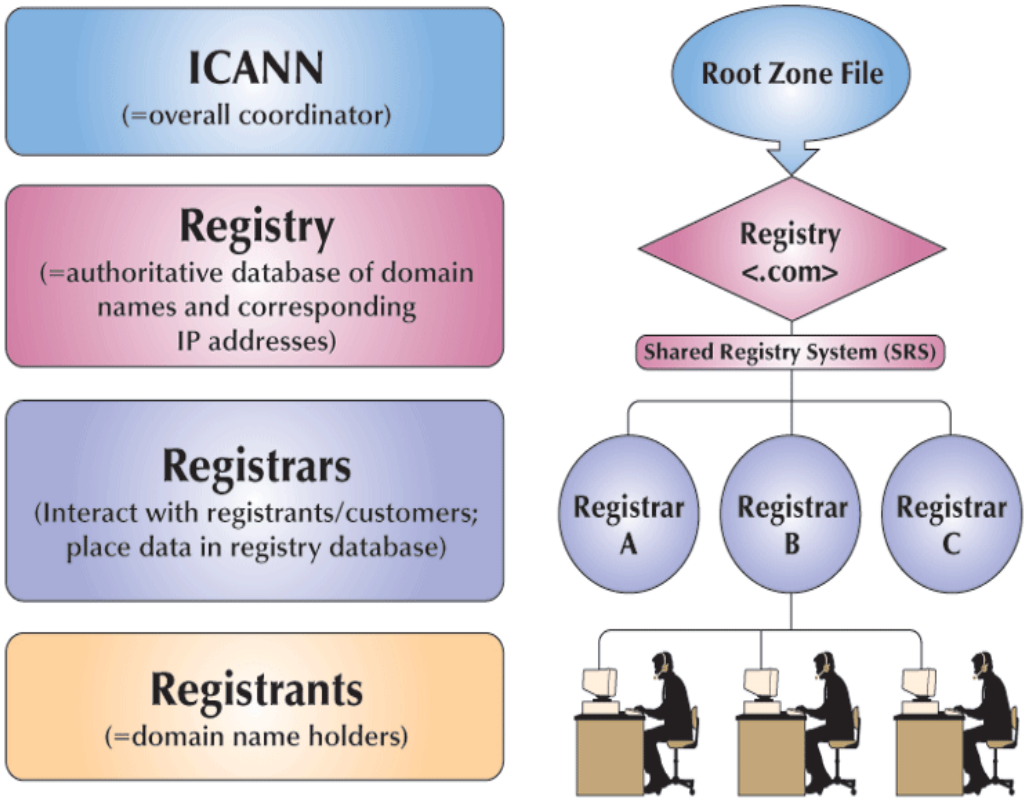

Fig. 16 .2: Basic DNS Registry Structure

Source: Senn (2004)

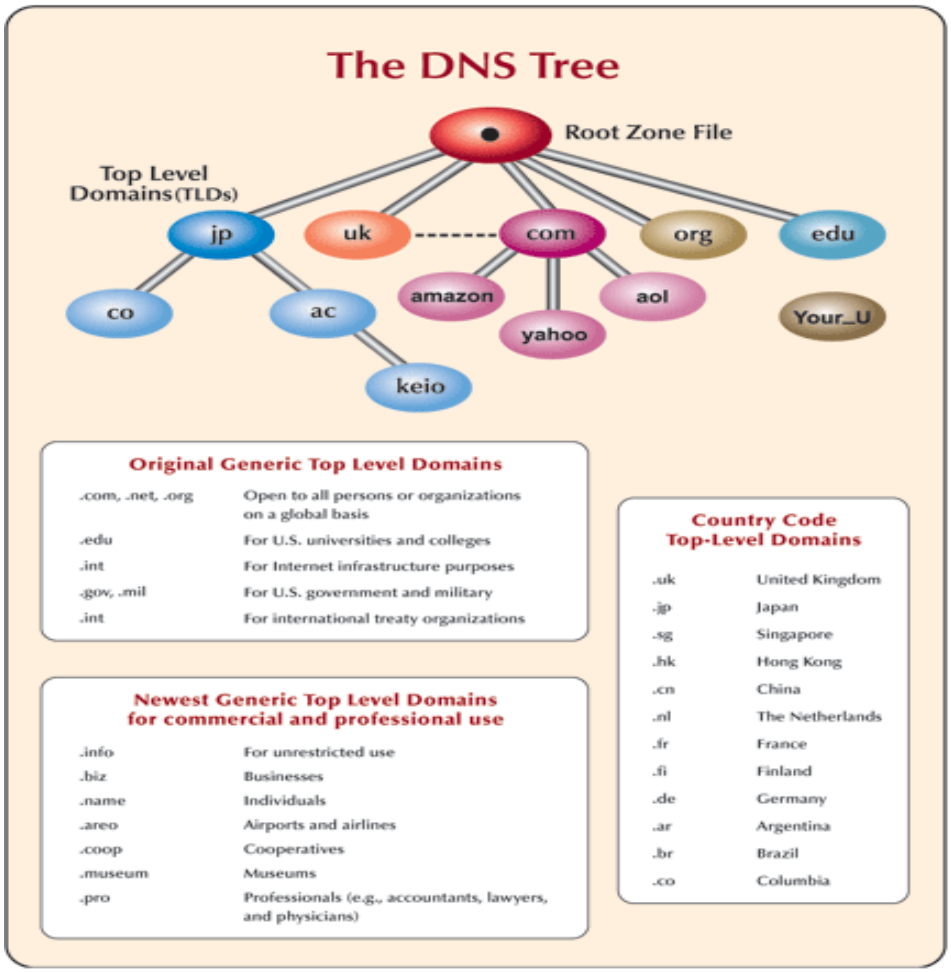

Fig. 16 .3: Internet Domain Names

Source**:** Senn (2004)

3.2.2 Addresses on Host Computers

- E-mail Addresses
- World Wide Web Addresses
- Uniform Resource Locator (URL***):*** A document's address on the WWW.
- FTP Addresses
- World Wide Web (WWW) or the Web***:*** The set of interconnected electronic documents, or Web pages, that are linked together over the Internet.
- Web Pages***:*** Interconnected electronic documents.
- Hyperlinks: Words and/or symbols highlighted by blinking, colour, or underline that connect one document to another related document on the Web.

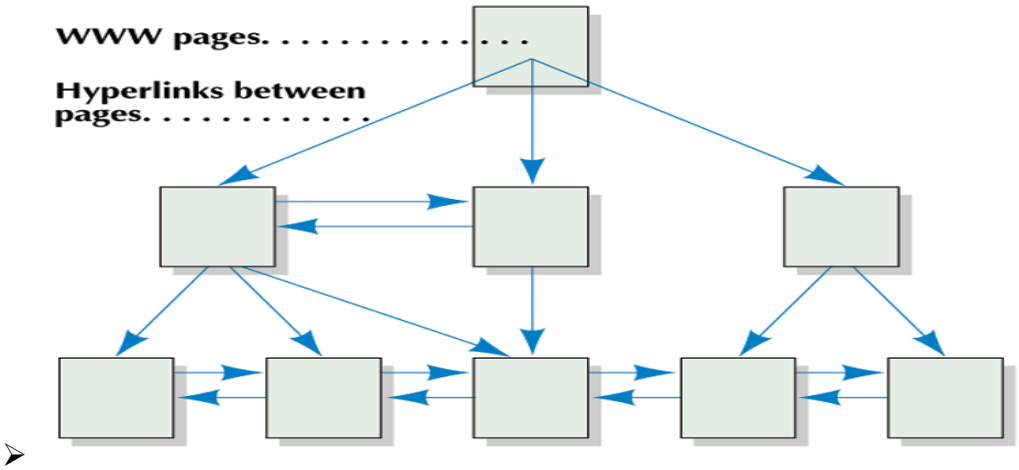

Fig. 16 .4: Hyperlink Structure

Source**:** Senn (2004)

3.3 E-Mail or Electronic Mail

This is the transmission of electronic messages over the Internet. People all over the world can now send e-mail containing text, graphics, pictures and different types of file attachments. You need the following to send and receive e-mail; e-mail account, access to the Internet, and an e-mail program. The most widely use e-mail programs are Outlook Express and Microsoft office outlook, others are located on the company's Web site like yahoo, google, hotmail,e.t.c. A typical e-mail message has three basic elements: header, message and signature.

The Header

The Header appears first and includes the following information:

- Addresses**:** addresses of the person sending, receiving, and, optionally anyone who is to receive copies. E-mail addresses have basically three main parts: the user's name, the domain name and the domain code. For example dr_ahmed@noun.edu.ng, the user's name is dr_ahmed . The server providing services for Dr Ahmed is **noun.** The domain code indicates that the provider is an educational institution in Nigeria.

- Subject: A one line statement used to present the topic of the message. It also appears when a person checks his/her mail box.

- Attachment: these are documents, photos or worksheets attached and send together with the typed text in a mail. The file name usually appears on the attachment line if a message contains an attachment.

The Message: this is the short note written in text format and usually straight to the point.

The Signature: the signature line provides additional information about the sender: name, address, and telephone number.

The draw back to this technology is the presence of **Spam** (unwanted and unsolicited mails) and **Computer Viruses** (destructive programs attached to Spam).

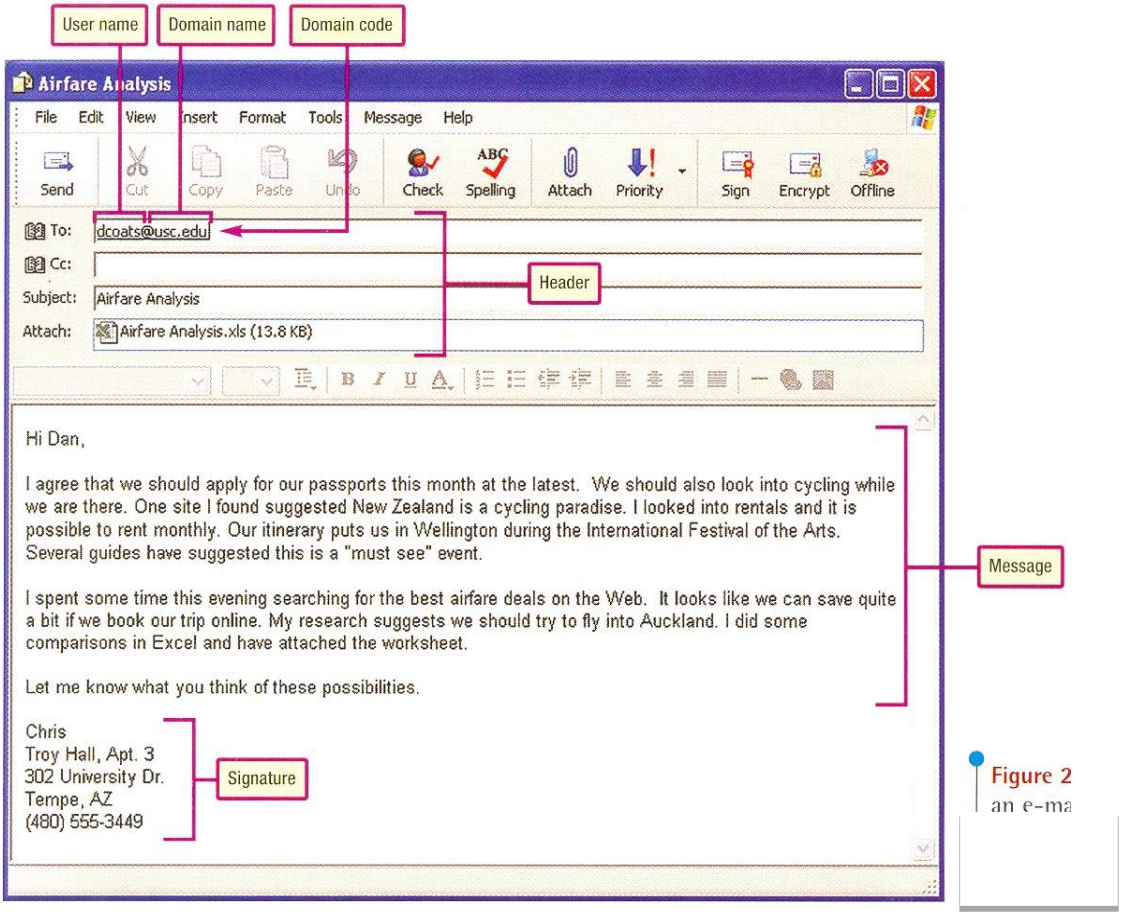

Fig. 16 .5: Showing Sample E-Mail

Source: O'Leary (2004)

3.4 Browsing the World Wide Web

Browsers are programs that provide access to Web resources. This software connects you to remote computers, open and transfers files, display text and images, and provides in one tool an uncomplicated interface to the Internet and Web documents. Some basic browsing terms include;

- **Surf:** this is the process of exploring the Web, by easily moving from one Web site to another using browser like Netscape Navigator, Microsoft Internet Explorer, Mozilla and Opera.

- **Uniform Resource Locators (URLs):** for browsers to connect to resources, the location or addresses of the resources must be specified. These addresses are called URLs. The first part presents the protocols (http://) used to connect to the resources while the second part presents the domain name (noun). The last part of the domain name following the dot (.) is the domain code (edu, ng).

- The URL http:// www.noun.edu.ng connects your computer to a computer that provides information about the National Open University of Nigeria, which is an educational institution located in Nigeria.

- **Protocol (http://):** these are rules for exchanging data between computers. The Protocol (http://) are the most widely used Web protocol.

- **Domain Name and Domain Code:** the domain name is the name of the server where the resource is located on the URL. Many URLs have additional parts specifying directory paths, file names, and pointers. The domain code identifies the type of organisation. For example:

.com commercial organisation

.edu educational institution

.ng Nigeria(.jp-Japan, .uk-United kingdom, .zo-South Africa, .gh- Ghana)

.org Organisation

.gov government of a nation

Hyperlinks or Links: when the browser connects to the Internet it opens up the Web page specified in the browser settings containing information about the site. Hyperlinks are the references that connect to other documents containing related information like text files, graphic images, audio, and video clips on a Web page.

Web Server: this is the computer that stores and shares document to nearby computer systems around the world. When a link is established with the Web Server the document is automatically displayed on your screen.

Applets: are links to special programs on a Web page, they are written in Java programming Language. Java applets are widely used to add interest and activities to a Web site by presenting animations, displaying graphics, providing interactive games, and much more.

One Home Page, Many Links

Home Page: The first page of a Web site, which identifies the site and provides information about the contents of electronic documents that are part of the site.

Creating Web Pages Using HTML

Hypertext Mark-up Language (HTML): A set of commands that specifies the position, size, and colour of text, the location of graphic information, and the incorporation of sound and video. HTML commands also identify the words or images that will serve as hyperlinks to other documents.

Browser Software

Web Browser: Client computer program designed to locate and display information on the World Wide Web.

Graphical Browser: A type of browser used with the Web that displays both text and images within a page.

- Title Bar
- Menu Bar
- Net Site
- Toolbar
- In-line Image
- Hyperlinks
- Status Bar
- Activity Indicator
- Scroll Bars

Navigating the Web

- Using Search Engines
- Directories

3.5 Web Utilities

These are specialised utility programs that make using the Internet and the Web easier and safer, some of these utilities are Internet services for connecting and sharing resources over the Internet. Others are browser programs that either become part of your browser or are executed from your browser.

Telnet

Telnet is an Internet standard that helps you connect to another computer remotely on the Internet and use that computer as if you were a terminal in the next room. You do that using the computer's IP address, for example **Telnet 192.168.1.30**, then you enter the computer's security code (Username and Password).

FTP

FTP is an acronym for File Transfer Protocol which is an Internet standard for transferring files. **Downloading** is the process of receiving a file from another computer while **Uploading** is the process of sending a file to another computer.

Plug-Ins

Plug-ins are automatically located and operated as part of a browser. Many Web sites require specific plug-ins to fully express their content. Some plug-ins are included in many of today's browsers while others must be installed.

Quick time player from Apple-for playing audio and video files

Windows Media player from Microsoft-for playing audio and video files and much more as discussed earlier.

Cosmos form Silicon Graphics-for displaying three dimensional graphics.

Adobe Reader from Adobe-for viewing and printing a variety of standard forms and other documents saved in a special format called PDF.

Filters

Filters are used by parents or organisations to block certain sites and to monitor use of the Internet and the Web. Filters are special programs used to generate reports detailing the total time spent on the Internet and the time spent on individual Web sites, chat groups, and news group. There are basically three well known filters: Cyberpatrol, Cybersitter, and NetNanny.

4.0 Conclusion

Understanding how to efficiently and effectively use the Internet to browse the Web, communicate with others, and locate information are indispensable ICT competencies.

5.0 Summary

You learnt in this unit that:

- the Web also known as the World Wide Web (WWW) provides a multimedia interface to resources available on the internet
- Web sites are group of related pages and Web portals are designed to encourage you to visit them each time you are on the Web, to act as your home base, and to use as a gateway to their resources
- Web utilities are specialised utility programs that make using the Internet and the Web easier and safer
- browsers are programs designed to locate and display information on the World Wide Web by displaying both text and images within the page.

6.0 Self-Assessment Exercise

1. When was the WWW launched and where?
2. Explain the elements of a URL and the purpose of each.

3. What do you understand by the terms downloading and uploading?

4. What are the three basic elements of an e-mail message?

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

O'Leary, T.J. & O'Leary, L. I. (2004). *Computing Today*. New York, US: McGraw-Hill.

Senn, J. A. (2004). *Information Technology: Principles, Practices, Opportunities.* (3rd ed.). New Jersey, US: Pearson Prentice Hall.

Unit 5 Electronic Commerce and Electronic Business

1.0 Introduction

In unit 3, you learnt that the Internet came with a lot of opportunities, especially its ease of access and use. Understanding how the Internet and the Web work to provide a foundation for e-commerce is an enormous potential. In this unit, you will learn how to trade over the Internet through electronic commerce.

2.0 Objectives

At the end of this unit, you should be able to:

- define the concept of e-commerce
- state the advantages and disadvantages of e-commerce
- list the types of e-commerce.

3.0 Main Content

Electronic commerce, also known as e-commerce, is the buying and selling of goods across the Internet. Shopping on the Internet is growing rapidly because e-commerce provides incentives for both buyers and sellers.

3.1 Players in the Game

There are two major parties in the e-commerce business world. They are:

1. buyers
2. sellers.

Buyer

From the buyer's perspective, goods and services can be purchased at any time of the day or night. Traditional commerce, also known as bricks and mortar business, is typically limited to standard business hours when the seller is open. Buyers don't have to travel physically to the seller's location. Busy parents don't have to arrange for a nanny or baby sitter in order to visit the market or go for shopping.

Seller

From the sellers perspective the cost associated with renting a shop is eliminated. For example a supermarket can operate on the Web without a physical store or employing a lot of sales staff. Traditional stores maintain an inventory of goods in their stores and periodically replenish this inventory from warehouses. With e-commerce, there is no in-store inventory and products are shipped directly from warehouse.

3.2 Types of E-Commerce

There are three basic types of electronic commerce: business-to-consumer (B2C), consumer-to-consumer (C2C), business-to-business (B2B).

Business-to-Consumer (B2C)

B2C e-commerce is the fastest growing type of e-commerce. It is used by large corporation, small corporations and start-up corporations. This involves the sale of a product or service to the general public or end-users. Most times this arrangement eliminates the middleman by allowing the manufacturers to sell directly to customers. Existing retailers use B2C e-commerce to create a presence on the Web as a means of reaching out to customers. Because extensive investments are not required to create traditional retail outlets and to maintain large marketing and sales staff, e-commerce allows start-up companies to compete with larger established firms.

The three most widely used B2C applications are online banking, financial trading, and shopping.

Online Banking: this is known as e-banking, a standard feature for banking institution. Customers are able to go online with a standard browser to perform many banking operations. These online operations include accessing account information, balancing check books, transferring funds, paying bills, re-charging mobile phones, and applying for loans. Using these electronic services is safer than using Automated Teller Machine (ATM).

Financial Trading: this is referred to as online stock trading or e-trading.it allows investors to research, buy, and sell stocks and bonds over the Internet. The greatest advantage of using e-trading compared to a traditional broker is cost. Traditional brokers provide advice based on their research. E-trading sites typically provide research on individual stocks that many e-traders use to make their trading decisions.

Shopping: this is referred to as e-retailing or e-tailing, it includes the buying and selling of wide range of consumer goods over the Internet. The greatest e-retailing success had been in books, travel, music, and health industries. **Web storefronts** are virtual stores that allow shoppers to visit, inspect merchandise, and make purchases on the Web. A new program called Web storefront creation packages or commerce servers has recently evolved to help business create virtual stores, that allow visitors to register, browse, place products into virtual shopping charts, and trade through a safe communication.

Consumer-to-Consumer (C2C)

This trading involves individuals selling to individuals, and takes the form of an electronic classified advert or an auction (Web auction). Goods are describe and interested buyers contact sellers to negotiate prices, and buyers and sellers never meet face-to-face. Sellers post description of products at a Web site and buyers submit bids electronically. There are two basic types of Web auction sites.

Auction House Sites: they sell a wide range of merchandise directly to bidders. The auction house owners present merchandise that is typically from a company's surplus stock. They are usually considered safe to shop.

Person-to-Person Auction sites: they operate more like flea markets. The owner of the site provides a forum for numerous buyers and sellers to gather. While the owners facilitate the building process, they are not involved in completing transactions or in verifying the authenticity of the goods sold. As with purchases at a flea market, buyers and sellers need to be cautious.

Business-to-Business (B2B)

B2B involves the sale of a service or product from one business to another. This is typically a manufacturer/supplier relationship. For example, a furniture manufacturer requiring raw materials such as wood, paint, and varnish. In B2B e-commerce manufacturers place an order electronically with suppliers and many times payment is made electronically. The most popular B2B e-commerce is for automobile parts, electronics including computers and health care.

3.3 Benefits of E-Commerce

1. Geographic Reach: geographical distance does not create a barrier to reaching and serving customers electronically or for interacting with suppliers.

2. Speed: near instant exchange of information means the interaction between buyer and seller takes place at rapid speed.

3. Productivity**:** individuals are more productive when they can do more work in a segment of time. Spending less time getting information means more time available for its use, therein producing greater efficiency.

4. Information Sharing: virtually any form of information- text, graphics, audio, video or animation- can be transmitted to recipients' location on the network.

5. New Features: new features can be added to product and services offered over communications network, including personalised, automatic notification of activities and instant delivery.

6. Lower Costs: the cost of business is reduced when companies and individuals can be reached quickly and without respect to geographical distance, while improved efficiencies results form electronic information exchange.

7. Competitive Advantage: those companies that develop and implement an effective electronic commerce strategy have business advantages over others in their industry that cannot over similar products, services, or operating capability.

3.4 Mode of Payment in E-Commerce

The single greatest challenge for e-commerce is the development of fast, secure, and reliable payment method for purchased goods. The three basic payment options are check, credit card, and electronic cash.

Check: these are the most traditional and perhaps the safest. Unfortunately, check purchases require the longest time to complete. After selecting an item, the buyer sends a

check through the mail. Upon receipt of the check, the seller verifies that the check is good. If it is good, then the purchased item is sent out.

Credit Card: with credit cards purchases are faster and more convenient than check purchases. Credit card fraud however is a major concern for both buyers and sellers. Criminals known as **carders** specialise in stealing, trading, and using stolen credit cards over the Internet.

Electronic Cash: this also refers to e-cash or cyber cash or digital cash, is the Internet equivalent to traditional cash. Buyers purchase e-cash from a third party (a bank that specialises in electronic currency) by transferring funds from their banks. Buyers purchase goods using e-cash while sellers convert the e-cash to traditional currency through the third party. Although not as convenient as credit card purchases, e-cash is more secure. A list of e-cash providers are: Ecash www.ecash.com, EmoneyMail www.emoneymail.com, Internet Cash www.internetcash.com, and PayPal www.paypal.com.

4.0 Conclusion

We should note that while there are numerous advantages to e-commerce, there are disadvantages as well, and just like any other type of commerce, e-commerce involves two parties: businesses and consumers.

Some of these disadvantages include the inability to provide immediate delivery of goods, the inability to sample goods before purchasing, and the issues relating to security of online payment.

5.0 Summary

In this unit we learnt that there are three types of e-commerce namely: business-to-consumer (B2C), consumer-to-consumer (C2C), business-to-business (B2B).With e-commerce, there is no in-store inventory and products are shipped directly from warehouse.

Electronic commerce (e-commerce) is the use of communication networks, including the public Internet, to conduct commercial transactions between businesses or with consumers.

6.0 Self-Assessment Exercise

1. What are the three types of e-commerce?
2. What are the three basic modes of electronic payments?
3. What is the greatest challenge for e-commerce development?
4. Among the three types of e-commerce, which one is the fastest growing business?

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

O'Leary, T.J. & O'Leary, L. I. (2004). *Computing Today*. New York, US: McGraw-Hill.

Senn, J. A. (2004). *Information Technology: Principles, Practices, Opportunities.* (3rd ed.). New Jersey, US: Pearson Prentice Hall.

Unit 6 Launching Information Technology Applications Projects

1.0 Introduction

In units 1 and 2, you learnt about the personal and enterprise communication networks. In this unit, you will learn about the origin of IT applications in business and understand why they have become so prominent.

2.0 Objectives

At the end of this unit, you should be able to:

- state the characteristics of ICT applications project
- identify the key players in ICT projects
- discuss the ICT department
- explain information system analysis and design.

3.0 Main Content

3.1 Information Technology Applications

There are basically two categories of IT applications, they are:

Single-user System/Personal System: An IT system used by only one person. A system that stands alone and is not interconnected with other companies or shared by other people.

Enterprise System: Usually involves the same types of components as a personal system, plus server or mainframe, database, and network. It is generally a shared system.

3.2 Characteristics of Personal and Enterprise System

Table 18.1: Characteristics of Personal and Enterprise System

S/No.	**Characteristics**	**Personal System**	**Enterprise System**
1	Designed for Hands-On Usage Hands-on System: A system in which a user enters data, directs processing, and determines the types of output to be generated.	X	X

2	Used to Improve Personal Performance	X	X
3	Tailored to Personal Preferences and Performance	X	X
4	Designed for Shared Use		X
5	Designed for Sharing Data Resources		X
6	Designed to Connect a Variety of Users		X
7	Designed for Larger Size and Scope		X

Source: Senn (2004)

3.3 Impact of IT Applications

Improved Productivity

Productivity *is* the relationship between the results of an activity (output) and the resources used to create those results (inputs).

Table 18.2: Showing Relationship between an Activity and Resources in Productivity

Inputs	Outputs
Hours of work required to complete a task	Length of time to complete report and number of projects produced
Equipment investment	Number of contracts negotiated
Total project budget	Amount of profit per complete contract

Source: Senn (2004)

Personal productivity software are software packages that permit activities to be completed more quickly, allow more activities to be completed in a particular period of time, or allow a task to be completed with fewer resources.

Greater Effectiveness

Effectiveness is the extent to which desirable results are achieved.

Increased Creativity and Innovation

This is the ability to come up with new ideas or better ways of carrying out a specific task.

3.3.1 Enterprise Systems Project

These are projects designed for organisations to promote efficient and safe use of data across the networks within their organisations.

- Systems Development*:* The process of examining a business situation, designing a system solution to improve that situation, and acquiring the human, financial, and information technology resources needed to develop and implement the solution.

- Project Management: The process of planning, organising, integrating, and overseeing the development of an IT application to ensure that the project's objectives are achieved and the system is implemented according to expectations(as will be discussed in details in the next module).

3.3.1.1 Project Proposal

It is a proposal for a systems project prepared by users or systems analysts and submitted to a steering committee for approval.

Steering Committee Review

Steering Committee is a group of people from various functional areas of a business that determines whether a systems development project proposal is desirable and should be pursued.

3.4 Information and Communication Technology Department

In the design of an organisational chart, the Chief Executive Officer (CEO) is the overall highest ranking staff of the organisation. The Chief Information Officer (CIO) is also the highest ranking information officer and he reports to the CEO. Information services are placed at the same level of importance as the traditional business functions (e.g., finance, human resources, sales and marketing, production and so on). The rest of information services are organised according to the following functions or centres:

System Development*:* Most system analyst and programmers work for the systems development group in the information services group or department of a business. Alternatively, systems analyst (under different titles) works for IT consulting firms, outsourcers, and application software vendors.

The **Centre for Excellence** is a group of experts who establish and enforces methods, tools, techniques, and quality for all system development projects. Experienced analyst, system designer, system builders man the centre. They provide consulting and mentoring services for all projects.

Data Administrator*:* This centre manages the data and information resources in the organisation. This includes the database that are (will be) used by system developers to support application. Data administrators usually employ several system analysts known as data analyst who analyses database requirements and design and construct the corresponding databases.

Telecommunications: This centre design, constructs, and manages the computer networks that have become essential to most businesses. The network analyst does the network design.

End-user computing: This centre supports the growing base of personal computers and local area networks in the end-user community. It provides system support; installation services, training, and help-desk services.

Computer Operations: This centre runs all of the shared computers including mainframes, minicomputers, and non-departmental services. This unit rarely employs system analyst.

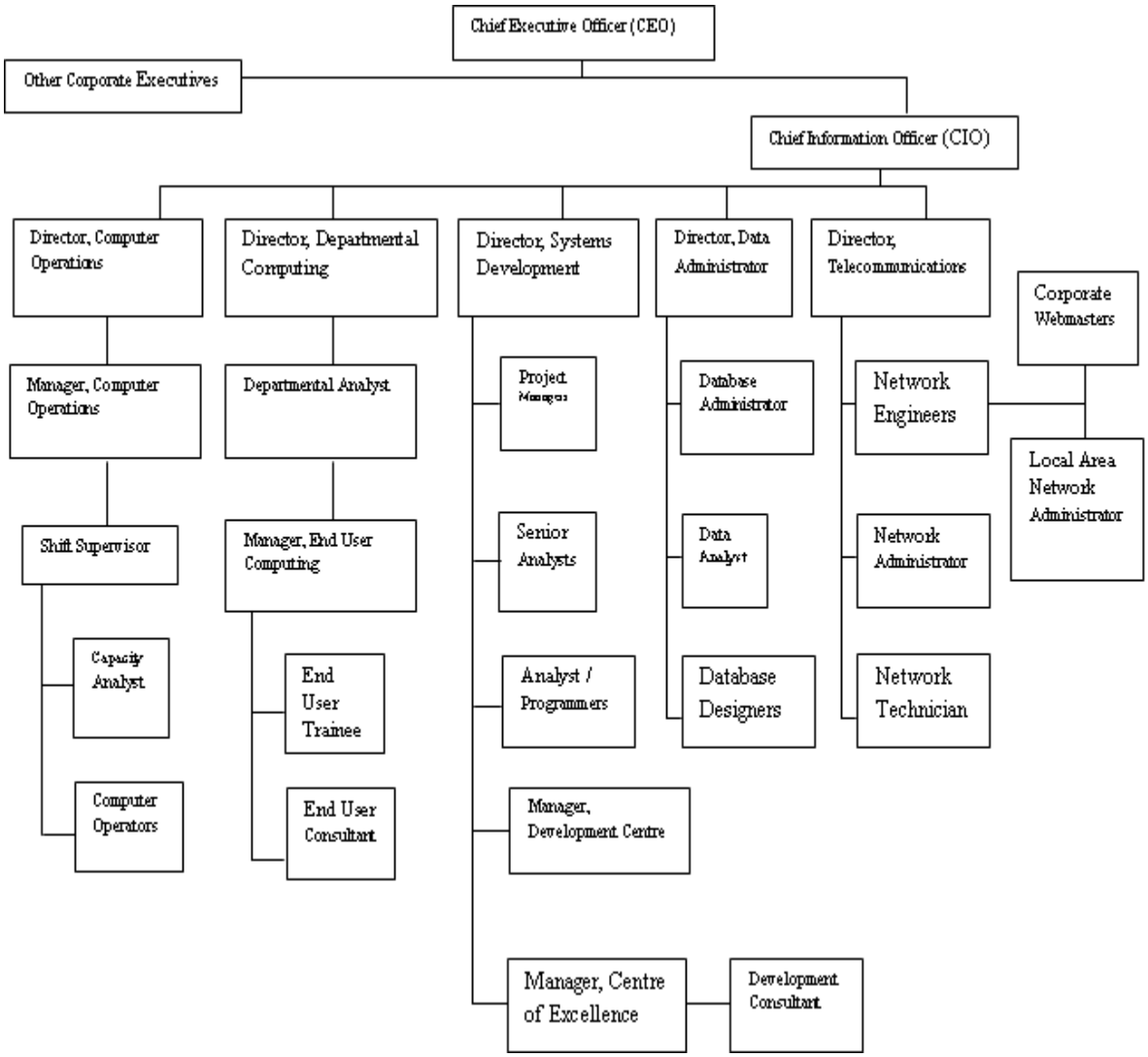

Fig. 18 .1: The Organisational Chart of an Information and Communication Technology (ICT) Department

Source**:** (Whitten, 2001).

3.3 System Analyst

The system analyst is the key player in most IT application projects, because the system analyst follows the steps described in the system life cycle (as will be explained in the next topic). The analyst plans and designs new systems or reorganises a company's computer resources for optimal usage. Analyst follows the systems development life cycle through all

steps: preliminary investigation, analysis, design, development, implementation, and maintenance.

Professional skills required of an analyst are:

- problem solving
- outcome thinking
- creativity
- meeting
- communication

The system analyst is the IT professional responsible for working with users to determine a system's requirements and for describing the features needed in the system. Systems analyst position usually requires a bachelors degree in computer science and technical experience in the following fields listed bellow because he or she will have to interact with experts during the project processes.

1. System Design: the technical work of designing the system and its software.
2. Programming/Analysis: determining system requirements and developing and implementing the systems.
3. Web Development: additional capabilities that enable him or her to use expertise in creating IT applications that will involve the Internet or company intranets and extranets, Web browsers, and the display of information using browsers.
4. Computer Security: techniques developed to safeguard information and information systems stored on computers.
5. Software Engineering: the writing of instructions for a computer to use to manipulate data, such as a word-processing program or a video game.
6. Database Administration: any collection of data organised for storage in a computer memory and designed for easy access by authorised users.
7. Computer Hardware Engineering**:** the study of the equipments involved in the function of a computer.
8. Networking: is the system used to link two or more computers. Network users are able to share files, printers, and other resources; send electronic messages; and run programs on other computers.

3.4 System Analysis and Design

A system is a collection of activities and elements organised to accomplish a goal. System analysts are computer professionals that typically conduct system analysis and design. System analysis and design is a phased problem solving procedure that make up the system

life cycle. The Systems Development Life Cycle (SDLC) is a six-phased set of activities that brings about a new IT application.

The phases are:

Problem Recognition/Preliminary Investigation: identifies problems or needs.

System Analysis/Requirements Determination: studies present system and specify new requirements.

Systems Design: designs new or alternate system to meet new requirements.

System Development and Construction: acquiring, developing and testing needed hardware and software.

Systems Implementation: installing new system and training people.

System Maintenance/Evaluation and Continuing Evolution: periodically evaluating and updating system as needed.

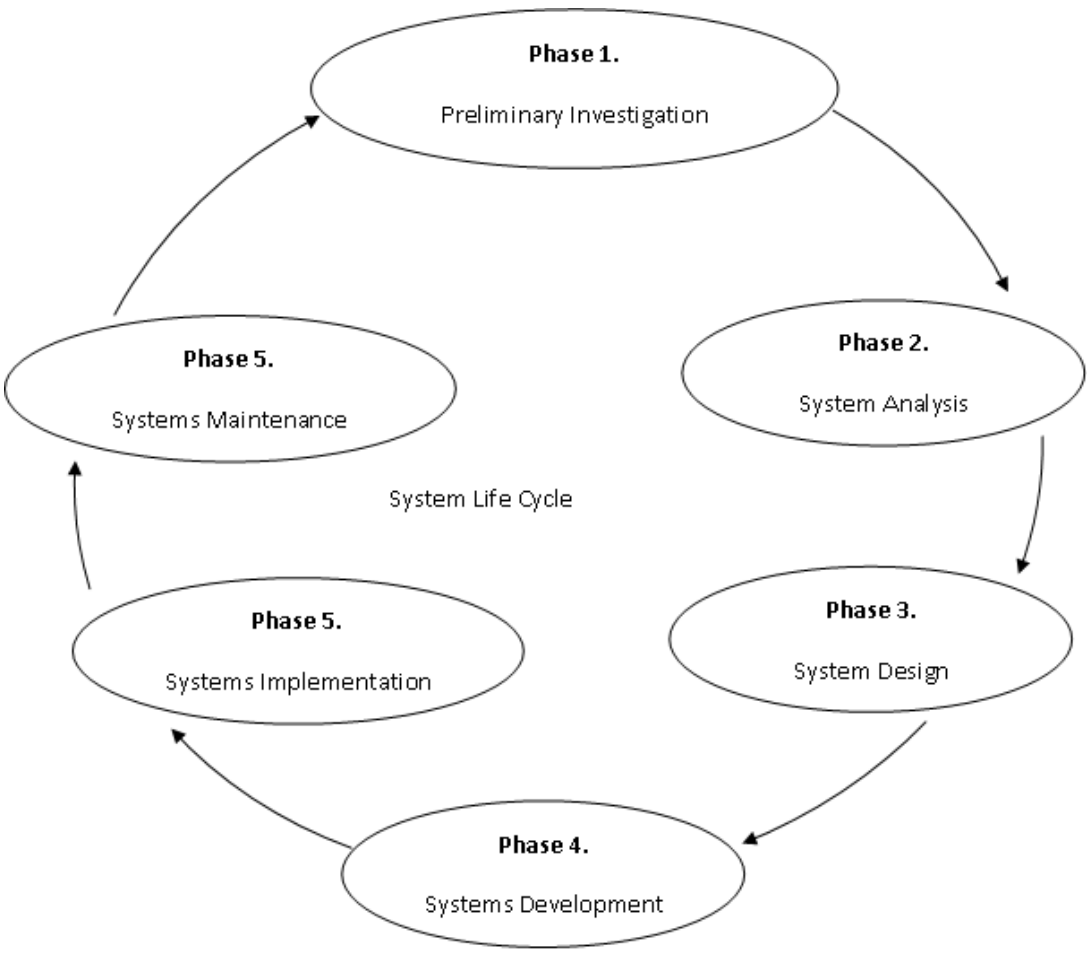

Fig. 18 .2: System Life Cycle

Source: O'Leary (2004)

Phase 1: Problem Recognition/Preliminary Investigation

The preliminary investigation determines the need for a new IT application project. It is typically requested by an end-user or a manager. Three tasks of this phase are defining the problem, suggesting alternative systems, and preparing a report.

Defining the Problem: the current information system is examined to determine who needs what information, when the information is needed and why. If the existing information system is large, then a system analyst conducts the survey. Otherwise the end-user conducts the survey.

Suggesting Alternative Systems: some possible alternative systems are suggested. Based on interviews and observations made in defining the problem, alternative information systems are identified.

Preparing a Short Report: to document and communicated the findings of preliminary investigation, a short report of alternative information systems is prepared.

Note that the merits and feasibility of a project proposal are determined in this phase.

There are three types of feasibility:

1. operational
2. financial/economic
3. technical

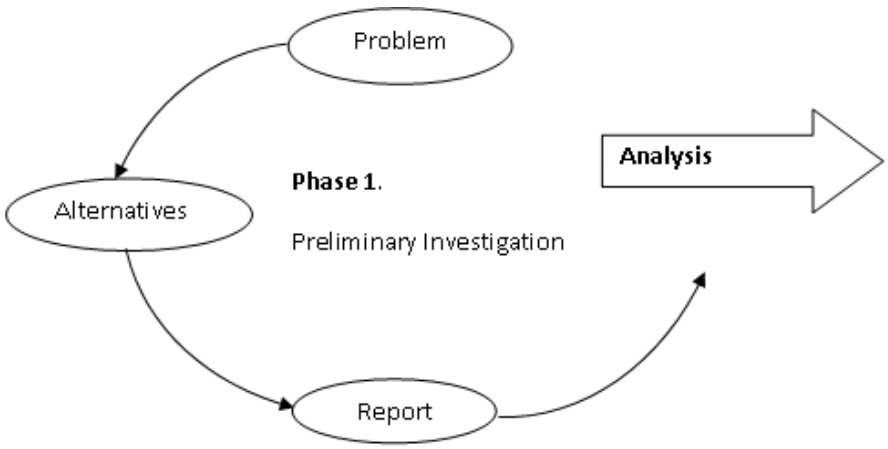

Fig. 18.3: Preliminary Investigation

Source: O'Leary (2004)

Phase 2: System Analysis/Requirements Determination

In system analysis data is collected about the current system. The focus is on determining the requirements for a new system, three tasks of this phase are gathering data, analysing data, and documenting the analysis.

Gathering Data: data is gathered by observations, interviews, questionnaires, and looking at documents. One helpful document is the organizational chat, which shows a company's function and level of management.

Analysing the Data: there are several tools for the analysis of data, including checklist, top-down analysis, grid chats, decision tables, and system flow charts.

Documenting System Analysis: to document and communicate the findings and phase 2, a systems analysis report is prepared for higher management.

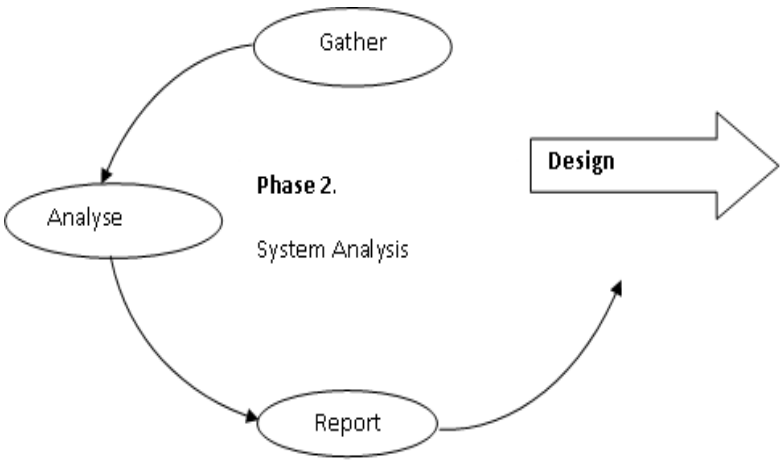

Fig. 18 .4: System Analysis

Source: O'Leary (2004)

Phase 3: Systems Design

In the system design phase, a new or alternative information system is designed. This phase consists of three tasks:

Designing Alternative Systems: alternative information systems are designed. Each alternative are evaluated for:

- economic feasibility(cost versus benefit),or time for system to pay for itself
- technical feasibility (hardware and software reliability)
- operational feasibility or system's work within the organisation.

Selecting the Best System: There are four questions considered when selecting the best system.

- Will the system fit into an overall system?
- Will the system be flexible enough to be modified if need be in the future?
- Will it be secured against unauthorised used?
- Will the system benefits exceed its costs?

Writing the System Report: To document and communicate the findings of this phase, a system design report is prepared for higher management.

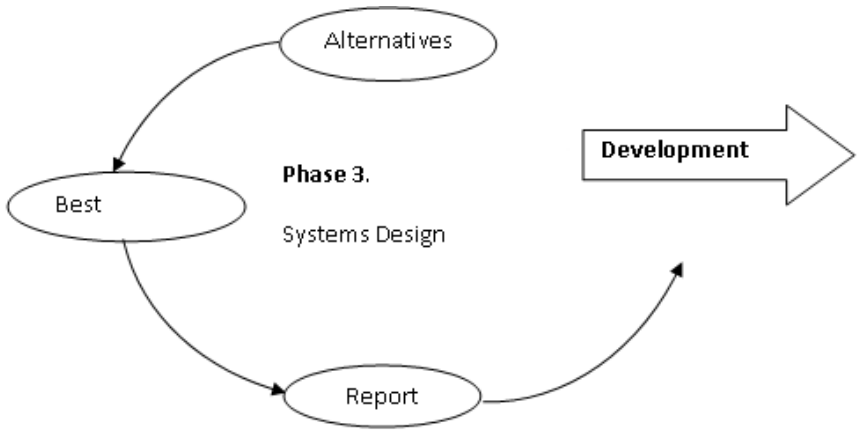

Fig. 18 . 5: System Design
Source: O'Leary (2004)

Phase 4: System Development and Construction

In the system development phase, software and hardware are acquired and tested.

Two ways to acquire software are:

Purchase: buy off the shelf packaged software to be modified if necessary.

Custom designed: create programs following programming steps.

Acquiring hardware is very critical and involves consideration for future company growth, existing networks, communication capabilities, and training.

Testing the new system involves using sample data. This step can take several months for a complex system.

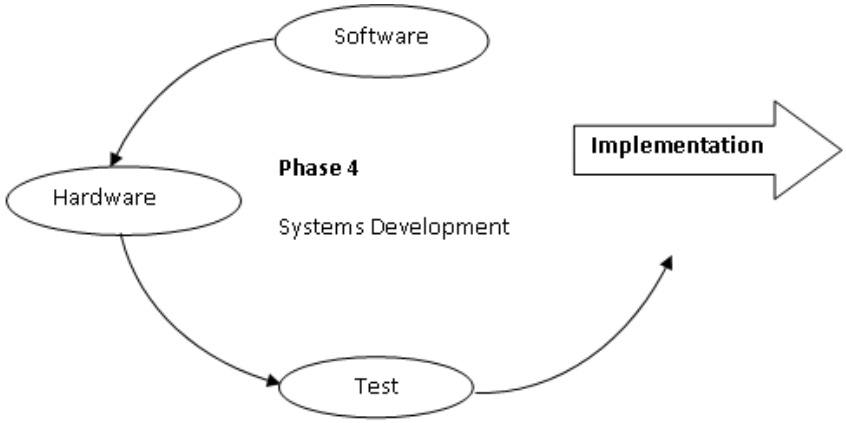

Fig. 18 .6: System Development
Source: O'Leary (2004)

Phase 5: System Implementation

This is the process of changing to the new system and training people.

Four ways to convert a system are:

Direct approach: abandoning the old and starting up the new system; can be very risky and not recommended.

Parallel Approach: operating the old and the new side by side until the new one proves its worth; low risk but expensive.

Pilot Approach: trying out the new system in only one part of an organisation. Compare to parallel, pilot is riskier and less expensive.

Phased Approach: implementing the new system gradually; low risk but expensive.

Training

A software trainer may be used to train end-users in the new system.

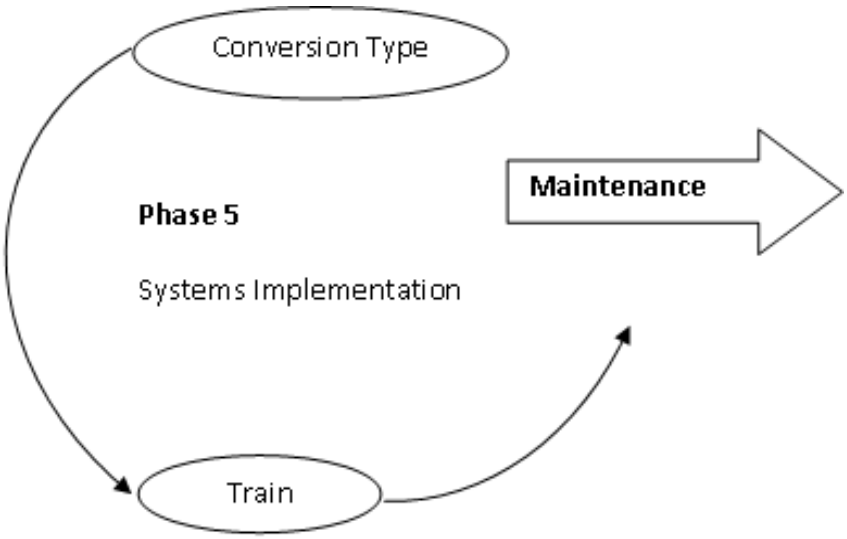

Fig. 18 .7: System Implementation
Source: O'Leary (2004)

Phase 6: System Maintenance/Evaluation and Continuing Evolution

This is the final phase. It consist of several audit followed by periodic evaluation.

System Audit: once the system is activated, the system analyst performs a system audit by comparing the new system to its original design specifications. If the system does not meet these specifications, some further redesign of the system may be required.

Periodic Evaluation: the new system is periodically evaluated to ensure that it is operating efficiently. If not, some redesign may be required.

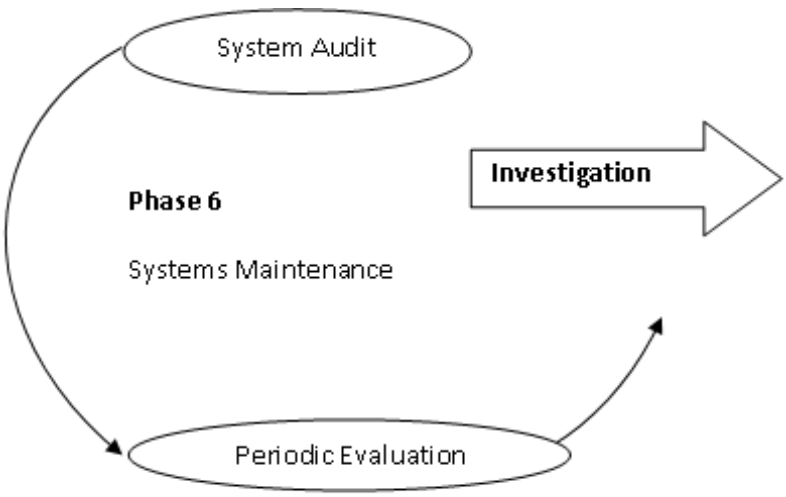

Fig. 18 .8: System Maintenance
Source: O'Leary 2004)

Note

Due to time pressures, it is not always feasible to follow every phase of the traditional system life cycle. Other alternatives that can be used will be found in the referenced books, which require less time and cost.

4.0 Conclusion

In conclusion, the ICT projects need careful planning before being launched. This is essential because if it is not properly analysed and designed, the application project will not meet the end-user's requirements.

5.0 Summary

In this unit you learnt about the:

- distinguishing characteristics of an IT application
- benefits of IT applications to users and enterprise
- six phases of the system development life cycle.

6.0 Self-Assessment Exercise

1. What are ICT applications?
2. What are enterprise system projects?
3. Who is the most valuable player in ICT application projects and what are his competent skills?
4. What is feasibility and whose responsibility is it in the IT department?

7.0 References/Further Reading

Norton, P. (2003). *Computing Fundamentals.* (5th ed.). United States of America: Glencoe/McGraw-Hill.

Paul, F., James, M. & Peter, H. (2004). *System Development Life Cycle Models and Methodology: System Analysis and Database development*. New Jersey, US: Pearson Prentice Hall.

Senn, J. A. (2004). *Information Technology: Principles, Practices, Opportunities.* (3rd ed.). New Jersey, US: Pearson Prentice Hall.

Whitten, L. W., Bentley, L. D. & Dittman, K. C. (2001). *System Analysis and Design Methods.* (5th ed.). New York, US: McGraw-Hill.