

CHAPTER 9

NETWORKING AND COMMUNICATION

Communications Links

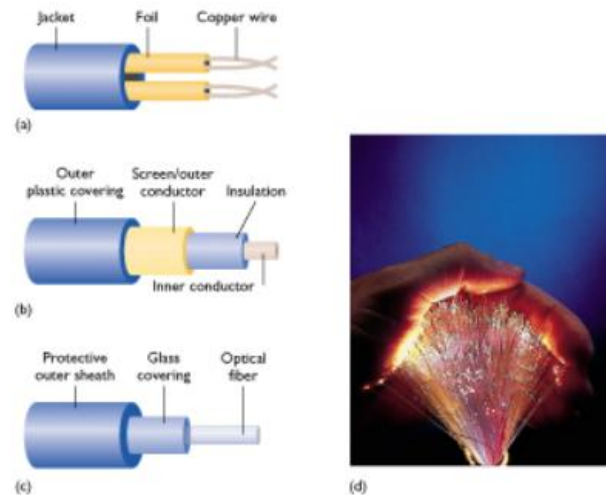
Learning Module Objectives

When you have completed this learning module you will have:

- Understood the meaning of Wired Pairs
- Understood the meaning of Coaxial
- Understood the meaning of Fiber Optics
- Understood the meaning of Microwave Transmission
- Understood the meaning of Satellite Transmission

Know About the Communication Links

- **Wired Pairs**
- **Coaxial Cables**
- **Fiber Optics**
- **Microwave Transmission**
- **Satellite Transmission**



Know About the Communication Links

Wired Pairs

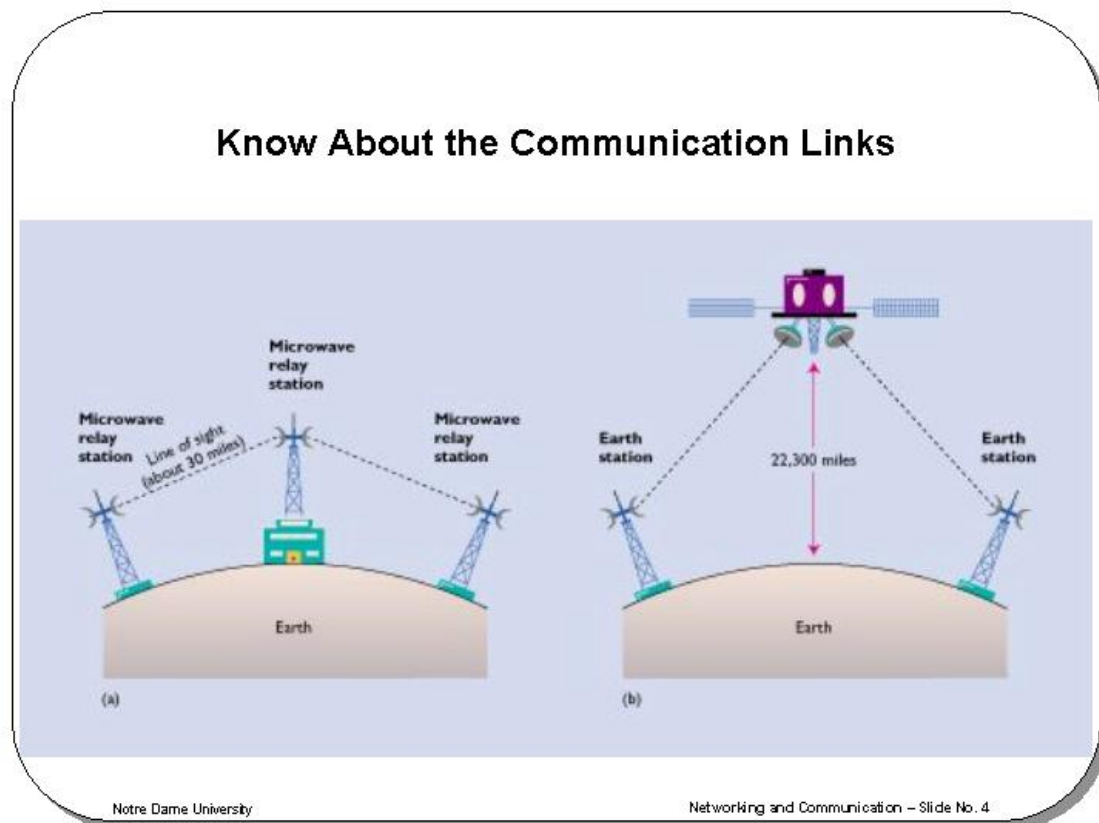
Wire pairs (known also as twisted pairs) are wires twisted together to form a cable, which is then insulated. Wire pairs are inexpensive. Further, they are often used because they have already been installed in a building for other purposes or because they are already in use in telephone systems. However, they are susceptible to electrical interference, or noise. Noise is anything that causes distortion in the signal when it is received. High-voltage equipment and even the sun can be sources of noise.

Coaxial

A coaxial cable is a single conductor wire within a shielded enclosure. Bundles of cables can be laid underground or undersea. These cables can transmit data much faster than wire pairs and are less prone to noise.

Fiber Optics

Traditionally, most phone lines transmitted data electrically over wires made of metal, usually copper. These metal wires had to be protected from water and other corrosive substances. Fiber optics technology eliminates this requirement. Instead of using electricity to send data, fiber optics uses light. The cables are made of glass fibers, each thinner than a human hair, that can guide light beams for miles. Fiber optics transmits data faster than some technologies, yet the materials are substantially lighter and less expensive than wire cables. It can also send and receive a wider assortment of data frequencies at one time. The range of frequencies that a device can handle is known as its bandwidth; bandwidth is a measure of the capacity of the link. Fiber optics offer very high bandwidth and very low noise susceptibility.



Microwave Transmission

Another popular medium is microwave transmission, which uses what is called line-of-sight transmission of data signals through the atmosphere. Since these signals cannot bend to follow the curvature of the earth, relay stations--often antennas in high places such as the tops of mountains and buildings--are positioned at points approximately 30 miles apart to continue the transmission. Microwave transmission offers speed, cost-effectiveness, and ease of implementation.

Satellite Transmission

The basic components of Satellite Transmission are **earth stations**, which send and receive signals, and a satellite component called a transponder. The **transponder** receives the transmission from an earth station, amplifies the signal, changes the frequency, and retransmits the data to a receiving earth station (The frequency is changed so that the weaker incoming signals will not be impaired by the stronger outgoing signals.) This entire process takes only a few seconds.

If a signal must travel thousands of miles, satellites are usually part of the link. A message being sent around the world probably travels by cable or some other physical link only as far as the nearest earth-satellite transmission station. From there it is beamed to a satellite, which sends it back to earth to another transmission station near the data destination. Communications satellites are launched into space, where they are suspended about 22,300 miles above the earth. Why 22,300 miles? That is where satellites reach geosynchronous orbit--the orbit that allows them to remain positioned over the same spot on the earth. However, not all satellites are in geosynchronous orbit; some are much closer to earth.

Communication Equipments

Learning Module Objectives

When you have completed this learning module you will have:

- Understood the meaning Hub
- Understood the meaning Switch
- Understood the meaning Router
- Understood the meaning Gateway
- Understood the meaning Proxy

Understand the Network Equipment Terminology

NIC (Network Interface Card)	Often abbreviated as NIC, an expansion board you insert into a computer so the computer can be connected to a network. The card will handle sending, receiving and error checking of transmitted data. Most NICs are designed for a particular type of network although some can serve multiple networks.
Bridge	A device that connects similar networks and due to its hardware/software combination recognizes the messages on the network and passes on those addressed to nodes in other networks.
Hub/Switch	A type of new routing that determines from the IP address sent with the data message which output port to use for the next part of its trip to the intended destination. Although the technology is new, it appears to be considerably faster than older router techniques.
Router	A device that forwards data messages along networks. A router is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network. Routers use headers and forwarding tables to determine the best path for forwarding the messages and they communicate with each other and configure the best route between any two hosts.
Gateway	A node on a network that serves as an entrance to another dissimilar network. Technically a gateway converts signals from one network to signals understood by the other dissimilar network. The gateway is associated with both a router, which use headers and forwarding tables to determine where packets are sent, and a switch, which provides the actual path for the packet in and out of the gateway.

The Telephone Network in Computing

Learning Module Objectives

When you have completed this learning module you will have:

- Understood the meaning PSTN
- Understood the meaning PSDN
- Understood the meaning ISDN
- Understood the meaning ADSL
- Understood the meaning DSL
- Understood the meaning Modem and Baud Rate

Understand the Use of the Telephone Network in Computing and Understand the Terminology



- **PSDN**
 - **PSDN or Public Switched Data Network is simply the technical name for the telephone system in use today.**
- **ISDN**
 - **Stands for "Integrated Services Digital Network." ISDN dates back to 1984, and allows much faster transfer rates than when using modems. Using ISDN, you can transfer 64K or 128K of data per second.**

Understand the use of Telephone Network in computing and Understand the Terminology

PSTN	PSTN or Public Switched Telephone Network is the technical name for the public telephone system. It is based on traditional 'copper wire' technology and can transmit analogue voice data.
PSDN	PSDN or Public Switched Data Network is simply the technical name for the telephone system in use today.
ISDN	Stands for "Integrated Services Digital Network." ISDN dates back to 1984, and allows much faster transfer rates than when using modems. Using ISDN, you can transfer 64K or 128K of data per second.
ADSL	Short for 'Asymmetric Digital Subscriber Line'. A more recent technology which allows more data to be sent over existing copper telephone lines, but requires a special same category modems. ADSL allows data transfer rates of ranging from 0.5 to 8 Mbps when receiving data (called the downstream rate) and from 16 to 640 Kbps when sending data (called upstream rate)
DSL	Refers collectively to all types of 'Digital Subscriber Lines', the two main categories being ADSL and SDSL. DSL technology allows faster data transfer while still using copper wires (as opposed to optic fiber cables)

Understand the Use of the Telephone Network in Computing and Understand the Terminology



- Fax
- Telex
- E-mail
- Teleconferencing
- Electronic Fund Transfer
- The Internet

Fax	A fax machine allows you to transmit printed material over the telephone system. The sending fax machine scans the page and converts the information into sound. The receiving fax converts the sound back into an image of the page for printing. Most modern computers contain a modem that is capable of sending/receiving faxes without the need for a separate, dedicated fax machine.
Telex	Telex is an old system used for sending typed messages via the Telex network, which has largely been replaced by the fax and email systems.
E-mail	Is the process of sending messages directly from one computer to another, where it is stored until the recipient chooses to receive it. A user can send data to a colleague downstairs, a message across town to that person who is never available for phone calls. It can reach many people with the same message, it reduces the paper flood, and it does not interrupt meetings the way a ringing phone does. Since e-mail does not require both participants to be present at the time of transmission, it is a boon to people who work on the same project but live in different time zones.
Tele-conferencing	A method of using technology to bring people and ideas together despite geographic barriers. There are several varieties of teleconferencing, but most common today is videoconferencing, whose components usually include a large screen, video cameras that can send live pictures, and an online computer system to record communication among participants. Although this setup is expensive to rent and even more expensive to own, the costs seem trivial when compared with travel expenses--airfare, lodging, meals--for in-person meetings.
Electronic Fund Transfer	Using electronic fund transfers (EFTs) , people can pay for goods and services by having funds transferred from various accounts electronically, using computer technology. One of the most visible manifestations of EFT is the ATM--the automated teller machine that people use to obtain cash quickly. A high-volume EFT application is the disbursement of millions of Social Security payments by the government directly into the recipients' checking accounts.
The Internet	The Internet is not just another online activity. It is considered by many to be the defining technology of the beginning of the 21st century, and it may well hold that status for several years.

Understand the Use of the Telephone Network in Computing and Understand the Terminology



- **Modem**
 - **Short for “MODulate/DEModulate”. The modem sends information from your computer across the telephone system.**
 - **The modem at the other end of the phone line, converts the signal back into a format that can be used by the receiving computer.**
- **Digital vs. Analogue**
 - **1 or 0**
- **Baud Rate**
 - **Speed of transfer**

Modem	Modem stands for “MODulator / DEModulator”. The modem sends information from your computer across the telephone system. The modem at the other end of the phone line, converts the signal back into a format that can be used by the receiving computer.
Digital vs. analogue	<p>A digital system uses 1 or 0 to transmit data or to represent data. Thus, a digital clock will display whole seconds, whole minutes and whole hours.</p> <p>An analogue system, such as a traditional clock, does not use multiples of 1 or 0, but rather uses the full range of numbers, including fractions. In this way, an analogue clock can display fractions of a second.</p>
Baud rate	The baud rate tells you how fast a modem can send/receive data. Most modern modems have a maximum baud rate of 56 Kilobits per second (Kb/sec).

Network Topologies

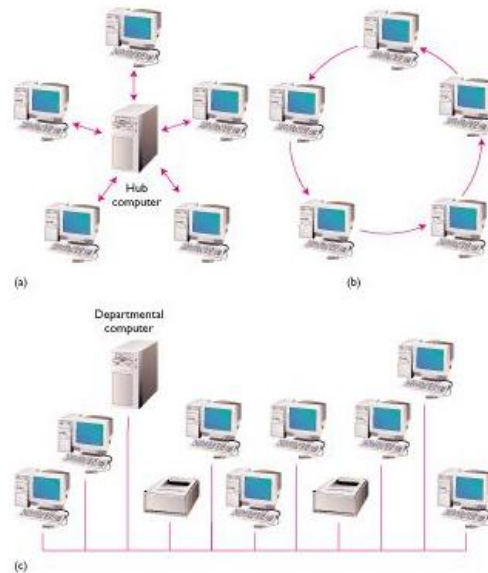
Learning Module Objectives

When you have completed this learning module you will have:

- Understood the meaning Star Network
- Understood the meaning Ring Network
- Understood the meaning Bus Network

Understand the physical Layout of a network. Network Topologies

- Star Network
- Ring Network
- Bus Network



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- Star Network** It has a hub computer that is responsible for managing the network. All messages are routed through the central computer, which acts as a traffic cop to prevent collisions. Any connection failure between a node and the hub will not affect the overall system. However, if the hub computer fails, the network fails.
- Ring Network** It links all nodes together in a circular chain. Data messages travel in only one direction around the ring. Any data that passes by is examined by the node to see if it is the addressee; if not, the data is passed on to the next node in the ring. Since data travels in only one direction, there is no danger of data collision. However, if one node fails, the entire network fails.
- Bus Network** It has a single line to which all the network nodes are attached. Computers on the network transmit data in the hope that it will not collide with data transmitted by other nodes; if this happens, the sending node simply tries again. Nodes can be attached to or detached from the network without affecting the network. Furthermore, if one node fails, it does not affect the rest of the network.

LAN and WAN

Learning Module Objectives

When you have completed this learning module you will have:

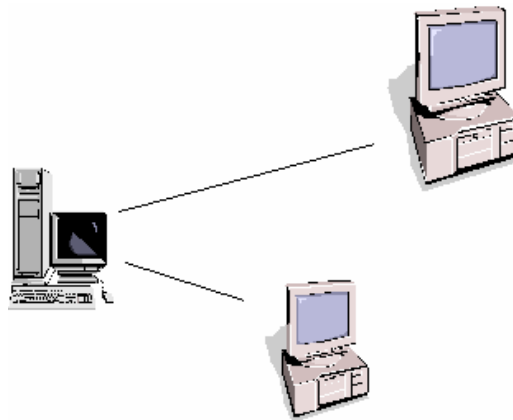
- Understood the meaning LAN
- Understood the meaning WAN
- Understood the meaning Workgroup Computing
- Understood the meaning Client/Server Network
- Understood the meaning Peer to Peer Network

Know the Definitions of Local Area Networks (LAN) and Wide Area Networks (WAN).

- **LAN**
 - A LAN (Local Area Network) is a system whereby individual PCs are connected together within a company or organization
- **WAN**
 - A WAN (Wide Area Network) as the name implies allows you to connect to other computers over a wider area (i.e. the whole world).

Know the definition of Local Area Networks (LAN) and Wide Area Networks (WAN)

What is a LAN? A LAN (Local Area Network) is a system whereby individual PCs are connected together within a company or organization. For instance if ten people are working together within an office it makes sense for them all to be connected. In this way, the office can have a single printer and all ten people can print to it. In a similar way, other devices such as modems or scanners can be shared. Even more useful is the ability to share information when connected to a network.



What is a WAN?

A WAN (Wide Area Network) as the name implies allows you to connect to other computers over a wider area (i.e. the whole world).

Know the Definition of Local Area Networks (LAN) and Wide Area Networks (WAN).

- **Workgroup Computing**
 - **If ten people are working together within an office it makes sense for them all to be connected.**
 - In this way the office can have a single printer and all ten people can print to it.
 - In a similar way other devices such as modems or scanners can be shared.
 - Even more useful is the ability to share information when connected to a network.
- **Client/Server Network**
- **Peer to Peer Network**

What is workgroup computing?

The idea of a workgroup is that groups of people working together can share their resources with each other. People within the workgroup can share information on their hard disks as well as sharing printers, modems and scanners. Many programs are also designed to be used within a workgroup. For instance when using a word-processor you may use what are called templates. For instance, your organization might want to use a standard Fax header sheet. If a template for this header sheet is held on a single computer but available to all the other computers then this has the advantage that when you need to make a change to the Fax header you only have to change one file, rather than change the files on each computer!

Client/Server Network

A client/server arrangement involves a **server**, the computer that controls the network. In particular, a server has hard disks holding shared files and often has the highest-quality printer, another resource to be shared. The clients are all the other computers on the network. Under the client/server arrangement, processing is usually done by the server, and only the results are sent to the client. A computer that has no disk storage ability and is used basically to send input to the server for processing and then receive the output is called a **thin client**. Sometimes the server and the client computer share processing. For example, a server, upon request from the client, could search a database of cars in the state of Maryland and come up with a list of all Jeep Cherokees. This data could be passed on to the client computer, which could process the data further, perhaps looking for certain equipment or license-plate letters. This method can be contrasted with a **file server** relationship, in which the server transmits the entire file to the client, which does all its own processing. Using the Jeep example, the entire car file would be sent to the client, instead of just the extracted Jeep Cherokee records.

Peer to Peer Network

All computers in a peer-to-peer arrangement have equal status; no one computer is in control. With all files and peripheral devices distributed across several computers, users share one another's data and devices as needed. Peer-to-peer networks are common in small offices with perhaps a dozen personal computers. The main disadvantage is lack of speed--peer-to-peer networks slow down under heavy use. Many networks are hybrids, containing elements of both client/server and peer-to-peer arrangements.

What is difference between Internet and Intranet

An Intranet is a smaller, closed version of the Internet, which can only be accessed by authorized members of an organization. Intranets are becoming an increasingly popular way to share information within a company or other organization. An Intranet uses Internet technologies to allow users to access company documents, search databases, schedule meetings and of course send emails. Once a company has installed a comprehensive Intranet many users need only one piece of software of their PC, a web browser.

What is difference between Intranet and Extranet

An Extranet is an Intranet which is partially accessible to authorized outsiders. An Intranet is normally only accessible by members of the same company or organization; an extranet also allows outsider who have been issued with a password to gain limited access to information held on a company network. Extranets are being used as a way for business partners to share information.