

BITT Polytechnic

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Branch: E.C.E

Semester: 4th

Subject: Data Communication & Computer Networking

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Objective question (The correct option is bolded)

- A. Information can be represented as a sequence of
1. byte patterns
 2. characters
 3. **bit patterns**
 4. images
- B. Both station can transmit and receive data simultaneously in
1. simplex mode
 2. Half duplex mode
 3. **Full duplex mode**
 4. None of Above
- C. In representation of text symbols, each set of the bit pattern is called
1. **Code**
 2. Unicode
 3. Coding
 4. sequence
- D. Data communications are the transfer of data through some
1. **transmission medium**
 2. linear medium
 3. Network LAN
 4. Protocols
- E. Keyboard and traditional monitors are examples of
1. **Simplex devices**
 2. Duplex devices
 3. Half Duplex devices
 4. Full Duplex devices
- F. The term that is used for physical path by which a message travels from sender to receiver is
1. Jitter
 2. Protocol
 3. **Transmission Medium**
 4. Information
- G. In star topology if the central hub goes down, it effects
1. One node
 2. No node
 3. **whole system**
 4. Don't know
- H. Protocols are, set of rules to govern
1. **Communication**
 2. Standards
 3. Metropolitan communication
 4. None of the above
- I. The parameter that refers to uneven delay of data packets in the delivery is
1. **Jitter**
 2. Timelessness

3. Accuracy
 4. Transmission medium
- J. In mesh topology, the devices are connected via
1. Multipoint link
 - 2. Point to point link**
 3. No Link
 4. None of the above

Q1. What is Transmission impairment? Explain.

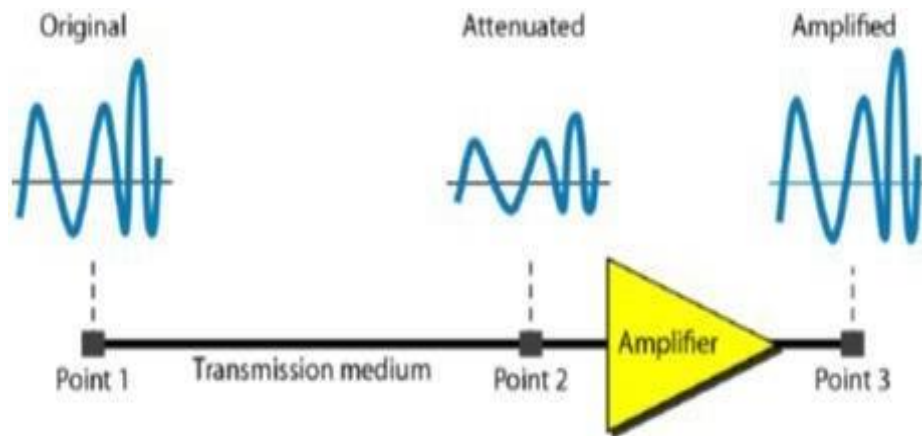
Answer:

Signals travel through transmission media, which are not perfect. The imperfection causes signal impairment. This means that the signal at the beginning of the medium is not the same as the signal at the end of the medium.

The three different causes of impairment are attenuation, distortion, and noise.

Attenuation:

Attenuation means a loss of energy. When a signal, simple or composite, travels through a medium, it loses some of its energy in overcoming the resistance of the medium. That is why a wire carrying electric signals gets warm, if not hot, after a while. Some of the electrical energy in the signal is converted to heat. To compensate for this loss, amplifiers are used to amplify the signal. The following figure shows the effect of attenuation and amplification.

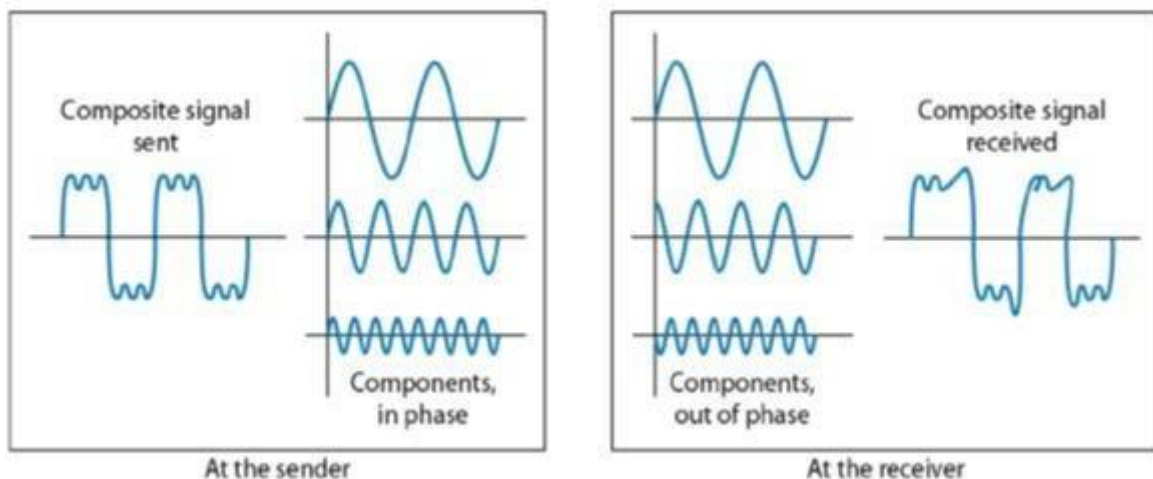


Decibel: Measure the relative power (attenuation)

$$dB = 10 \log_{10} P_2/P_1$$

Distortion:

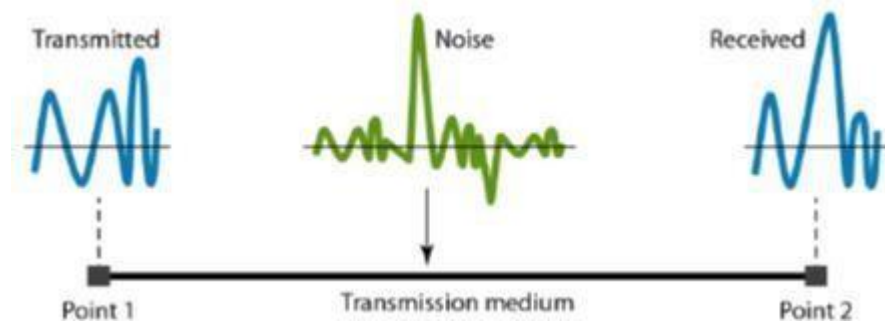
Distortion means that the signal changes its form or shape. Distortion can occur in a composite signal made of different frequencies. Each signal component has its own propagation speed (see the next section) through a medium and, therefore, its own delay in arriving at the final destination. Differences in delay may create a difference in phase if the delay is not exactly the same as the period duration. In other words, signal components at the receiver have phases different from what they had at the sender. The shape of the composite signal is therefore not the same. The following figure shows the effect of distortion on a composite signal.



Noise:

Noise is another cause of impairment. Several types of noise, such as thermal noise, induced noise, crosstalk, and impulse noise, may corrupt the signal.

Thermal noise is the random motion of electrons in a wire which creates an extra signal not originally sent by the transmitter. Induced noise comes from sources such as motors and appliances.



These devices act as a sending antenna, and the transmission medium acts as the receiving antenna. Crosstalk is the effect of one wire on the other. One wire acts as a sending antenna and the other as the receiving antenna. Impulse noise is a spike (a signal with high energy in a very short time) that comes from power lines, lightning, and so on. The following figure shows the effect of noise on a signal.

Q2. What is Shanon capacity for noisy channel?

Answer:

In reality, we cannot have a noiseless channel; the channel is always noisy. In 1944, Claude Shannon introduced a formula, called the Shannon capacity, to determine the theoretical highest data rate for a noisy channel:

$$\text{Capacity} = \text{bandwidth} * \log_2 (1 + \text{SNR})$$

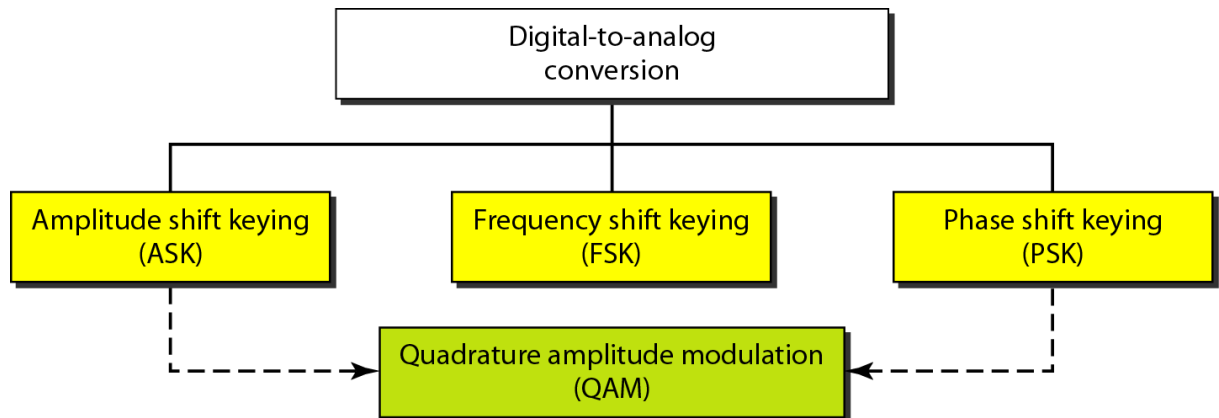
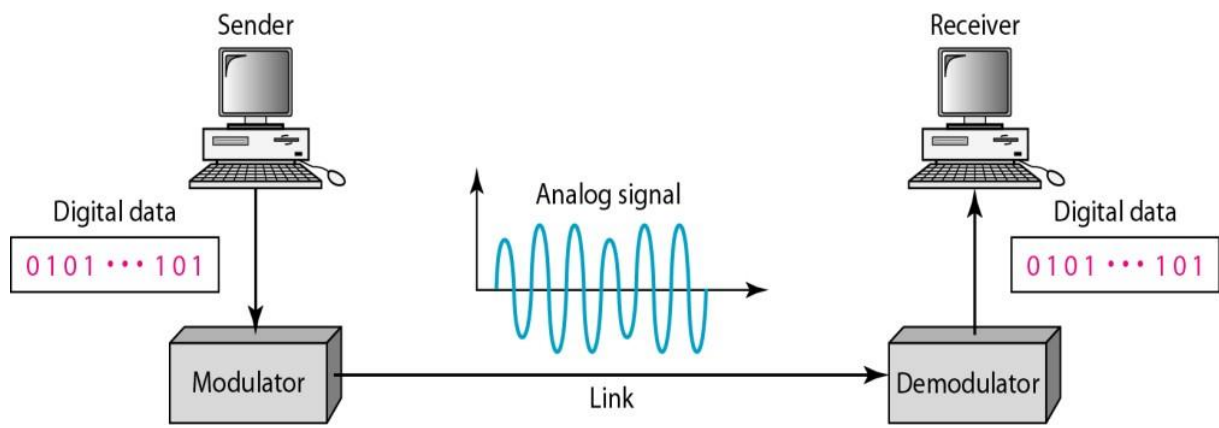
In this formula, bandwidth is the bandwidth of the channel, SNR is the signal-to-noise ratio, and capacity is the capacity of the channel in bits per second. Note that in the Shannon formula there is no indication of the signal level, which means that no matter how many levels we have, we cannot achieve a data rate higher than the capacity of the channel. In other words, the formula defines a characteristic of the channel, not the method of transmission.

Q3. Explain ASK, FSK , and PSK with neat diagram

Answer:

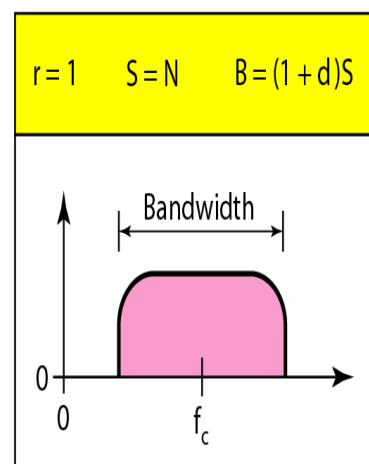
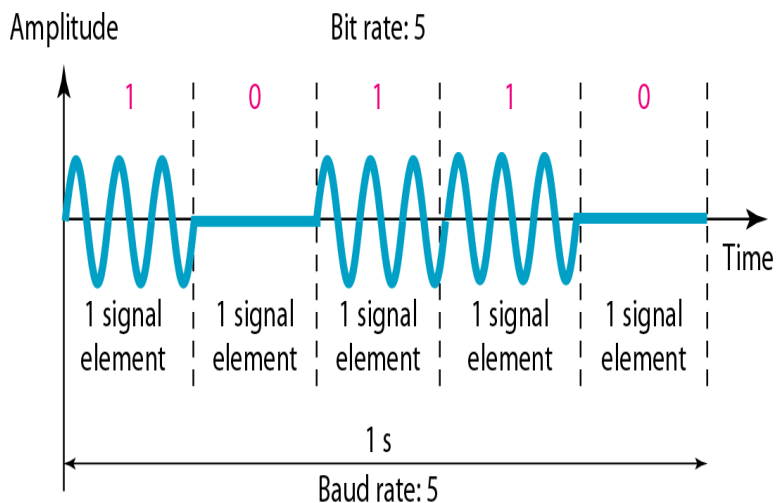
Digital to Analog conversion

- Digital data needs to be carried on an analog signal.
- A carrier signal (frequency f_c) performs the function of transporting the digital data in an analog waveform.



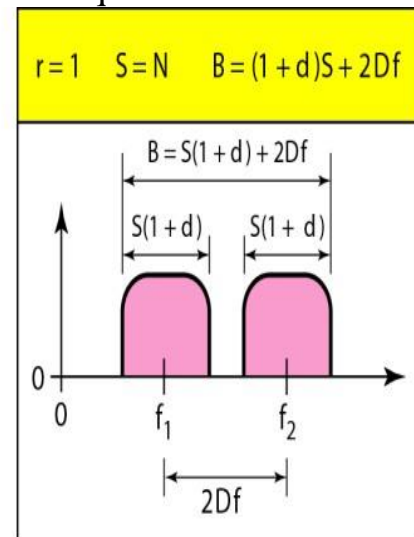
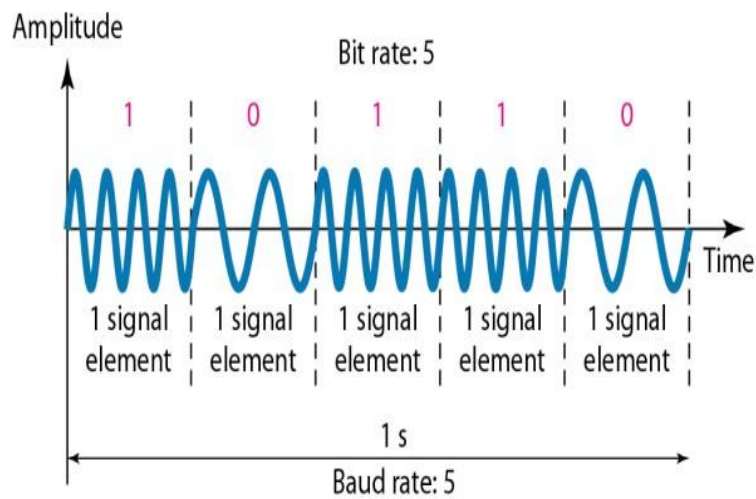
Amplitude Shift Keying (ASK)

- ASK is implemented by changing the amplitude of a carrier signal to reflect amplitude levels in the digital signal.
- For example: a digital “1” could not affect the signal, whereas a digital “0” would, by making it zero.



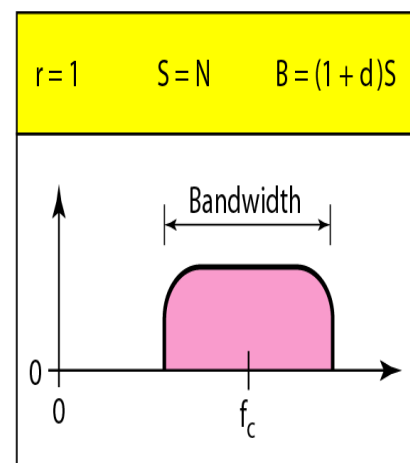
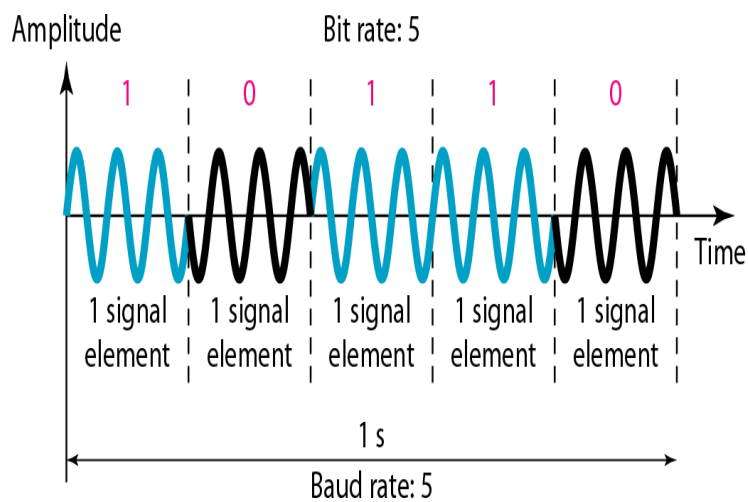
Frequency Shift Keying

The two binary values are represented by two different frequencies



Phase Shift Keying

- The phase of carrier signal is shifted to represent the data.
- In PSK, the phase is varied to represent binary 1 or 0.



5. What are the various types of connecting devices?

There are five types of connecting devices

1. Repeaters
2. Hubs
3. Bridges
4. Routers
5. Switches.

6. Define Flow control

It refers to a set of procedures used to restrict the amount of data the sender can send before waiting for an acknowledgement

7. What are the categories of Flow control?

The categories of Flow control are

- Stop& wait
- Sliding Window

8. Mention the disadvantages of stop& wait.

- Inefficiency
- Slow process

9. What are the functions of data link layer?

The functions of data link layer are

- Flow control
- Error control

10. Define Link Discipline

It coordinates the link system. It determines which device can send and when it can send.

Long Question

1. Explain the different types of computer network.

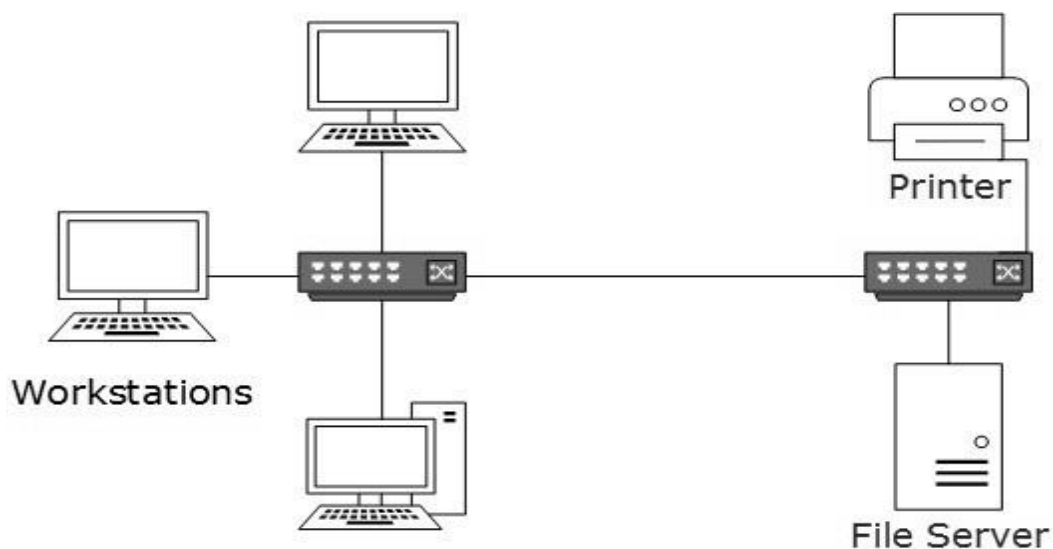
Answer: The different types of computer network are:

- i) Local Area Network (LAN)
- ii) Metropolitan Area Network (MAN)
- iii) Wide Area Network (WAN)

i) Local Area Network (LAN)

A computer network spanned inside a building and operated under single administrative system is generally termed as Local Area Network (LAN). Usually, LAN covers an organization offices, schools, colleges or universities. Number of systems connected in LAN may vary from as least as two to as much as 16 million.

LAN provides a useful way of sharing the resources between end users. The resources such as printers, file servers, scanners, and internet are easily sharable among computers.



LANs are composed of inexpensive networking and routing equipment. It may contain local servers serving file storage and other locally shared applications. It mostly operates on private

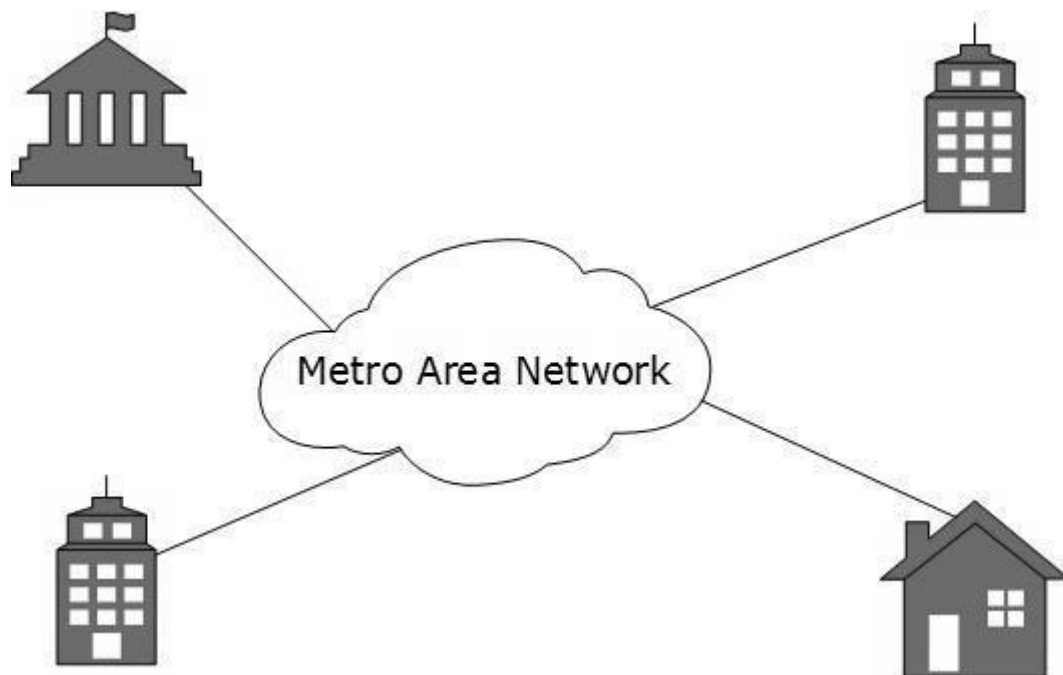
IP addresses and does not involve heavy routing. LAN works under its own local domain and controlled centrally.

LAN uses either Ethernet or Token-ring technology. Ethernet is most widely employed LAN technology and uses Star topology, while Token-ring is rarely seen.

LAN can be wired, wireless, or in both forms at once.

ii) **Metropolitan Area Network (MAN)**

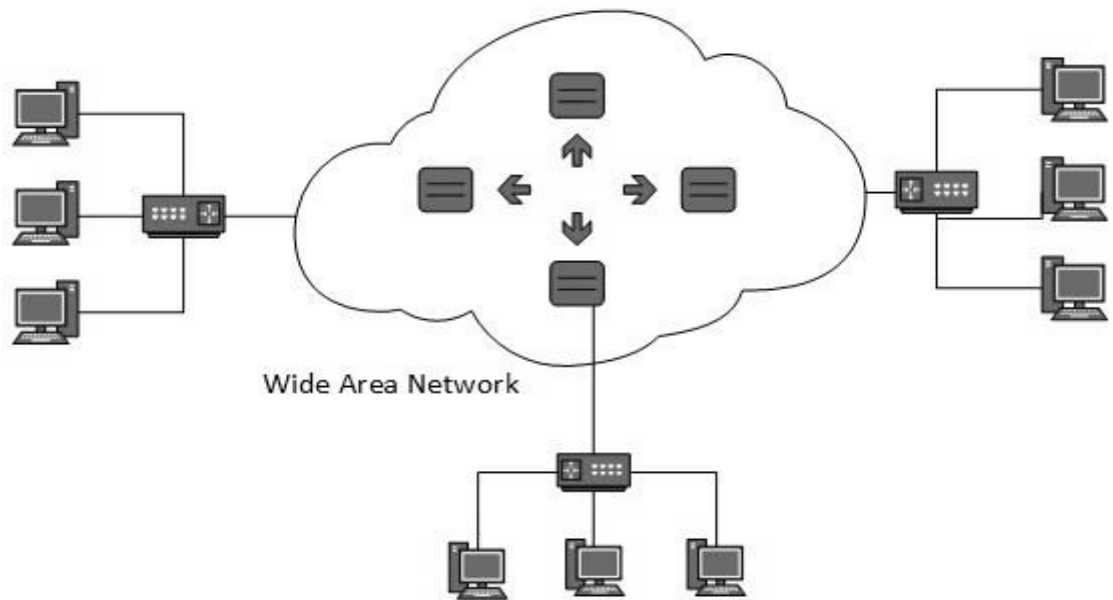
The Metropolitan Area Network (MAN) generally expands throughout a city such as cable TV network. It can be in the form of Ethernet, Token-ring, ATM, or Fiber Distributed Data Interface (FDDI). Metro Ethernet is a service which is provided by ISPs. This service enables its users to expand their Local Area Networks. For example, MAN can help an organization to connect all of its offices in a city.



Backbone of MAN is high-capacity and high-speed fiber optics. MAN works in between Local Area Network and Wide Area Network. MAN provides uplink for LANs to WANs or internet.

iii) **Wide Area Network (WAN)**

As the name suggests, the Wide Area Network (WAN) covers a wide area which may span across provinces and even a whole country. Generally, telecommunication networks are Wide Area Network. These networks provide connectivity to MANs and LANs. Since they are equipped with very high speed backbone, WANs use very expensive network equipment.

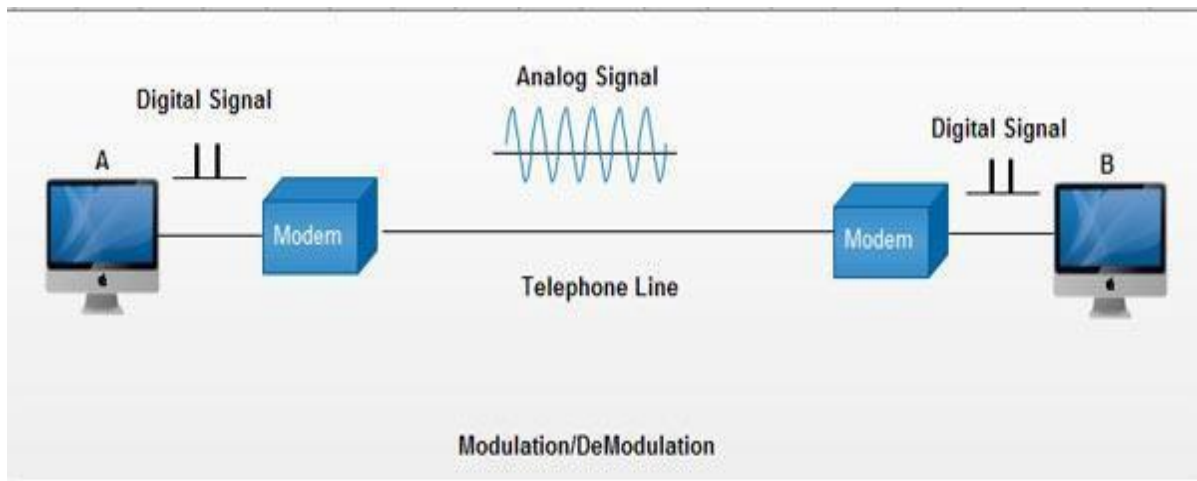


WAN may use advanced technologies such as Asynchronous Transfer Mode (ATM), Frame Relay, and Synchronous Optical Network (SONET). WAN may be managed by multiple administration.

2. Explain the concept of MODEM.

Answer: Modem is abbreviation for Modulator – Demodulator. Modems are used for data transfer from one computer network to another computer network through telephone lines.

- The computer network works in digital mode, while analog technology is used for carrying messages across phone lines.
- Modulator converts information from digital mode to analog mode at the transmitting end and demodulator converts the same from analog to digital at receiving end.
- The process of converting analog signals of one computer network into digital signals of another computer network so they can be processed by a receiving computer is referred to as digitizing.



Modems can be of several types and they can be categorized in a number of ways.

Categorization is usually based on the following basic modem features:

- 1. Directional capacity: half duplex modem and full duplex modem.
- 2. Connection to the line: 2-wire modem and 4-wire modem.
- 3. Transmission mode: asynchronous modem and synchronous modem.

Categories of modem

- External modem
- Internal modem

Any external modem is attached to any computer has an RS-232 port.

An internal modem comes as an expansion board that can be inserted into a vacant expansion slot.

Types of modem

- Standard fax modem
- Digital cable modem
- ISDN modem
- Digital subscribes line modem
- Satellite modem