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COMPUTER NETWORKS

MC-308

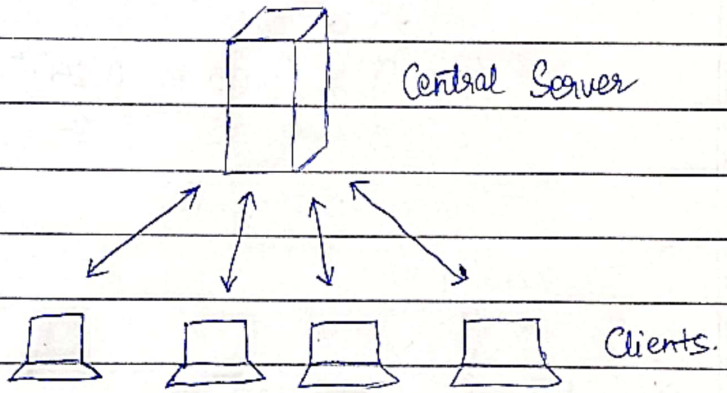
ASSIGNMENT-1

SUBMITTED BY: AIMAN SIDDIQUA

2K18/MC/008

1. CLIENT-SERVER MODEL

A client-server network is a system where one or more computers called clients connect to a central computer named as a server to share or use resources.



Examples of servers include web servers, mail servers and file servers.

Each of these servers provide resources to client devices such as desktop computers, laptops, ~~dest~~ ~~laptops~~ tablets and smartphones.

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ADVANTAGES

* The server system holds the shared files
* Network access is provided only to authorized users through user security at the server.

DISADVANTAGES.

* The implementation of the network is quite expensive.
* If a server fails, the entire network crashes.

(2.) CATEGORIES OF NETWORK.

(i) Personal Area Network (PAN)
→ Revolves around one person
→ Example Interacting with mouse

(ii) Local Area Network (LAN)
→ connect groups of computers across short distances (within a building or b/w a group of two or three buildings in close proximity)
→ Examples:
1. IEEE 802.3 - Ethernet (Bus based broadcast network)
2. IEEE 802.3 (IBM Token Ring)

(iii) Metropolitan Area Network (MAN)
→ spread across a city
→ Example: Cable Television Network,

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IEEE 802.16

(iv) Wide Area Network (WAN)
→ Spread across a country.
→ Example : Internet.

(v) Wireless Network
Example: Phone calls, Bluetooth

(vi) Home Network

(vii) Inter network or internet
Example : Router, Hub.

(3.) CONNECTION ORIENTED SERVICE
- Establish a connection between source & receiver
- Send the data
- Release the connection

Example: Telephone service

CONNECTIONLESS SERVICE
It is used to transfer data from source to receiver without creating any connection.

Example : Postal Service

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Connection Oriented Service is reliable whereas Connectionless Service is unreliable

In Connection oriented Service data is acknowledged while in connectionless service there is no acknowledgement, hence we don't know if the receiver received it.

(4.) Functionalities of Session Layer:

(i) Session Management
- → Establishing session
- → Maintaining session
- → Terminating session

(ii) Synchronization
It adds synchronization points or check points in data streams for long communications. This ensures that data streams up to the checkpoints are successfully received & acknowledged. In case of any failures only the streams after the checkpoints have to be re-transmitted.

(iii) Dialog Control
Manages whose turn it is to transfer data. It allows the system to communicate in either half duplex or full duplex mode of communication.

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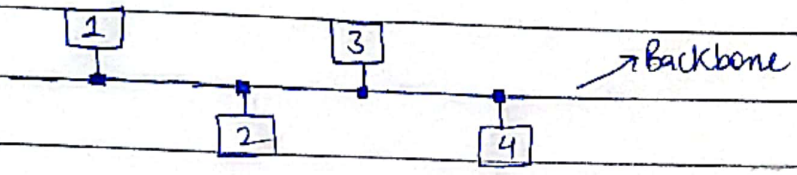
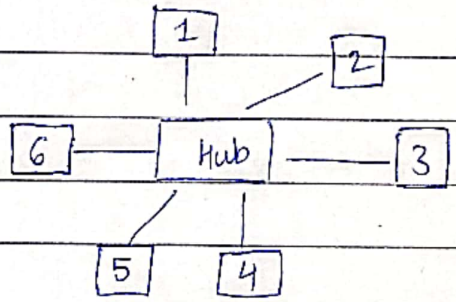
(5.) Various networks associated with Physical layer in the OSI model:

BUS TOPOLOGY



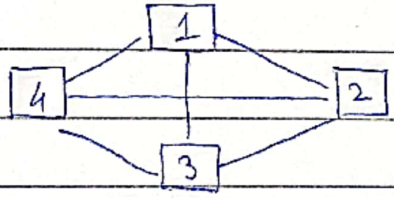
→ Multi-point Network
→ Non-Robust (if backbone fails network fails)
→ Number of links = n+1

STAR TOPOLOGY



→ Robust
→ Point to Point connection
→ Number of links required = n

MESH TOPOLOGY



→ Number of links required = $n(n-1)/2$
→ Every device is connected to every other device
→ Robust

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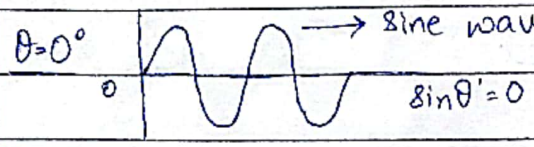
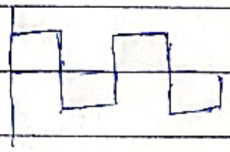
(6) (a) ANALOG AND DIGITAL DATA TRANSMISSION

Analog signal is characterized by being continuously variable along amplitude and frequency.
Example: Telephone Signal.



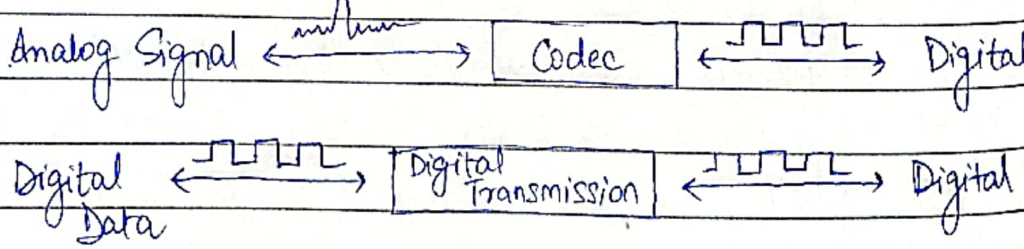
It has low bandwidth which means low data transmission rates.

Digital Signal is a discrete signal represented as either changes in voltage or changes in light levels.



It has high bandwidth that can support high speed data.

CODEC:
A codec converts analog signals into digital signals.



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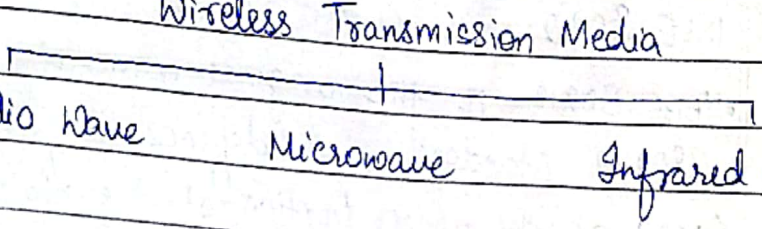
(b) WIRELESS TRANSMISSION MEDIA.

→ Also Known as unguided media

→ It transports electromagnetic waves without using a physical conductor



RADIO TRANSMISSION

- Radio waves are easy to generate, can travel long distances and can penetrate buildings easily, so they are widely used for communication both indoors & outdoors.
- They travel in all directions from source

MICROWAVE TRANSMISSION

- Microwaves travel in straight lines, If the towers are too far apart, the Earth will get in the way. Consequently repeaters are needed periodically.
- Microwaves do not pass through buildings well.

INFRARED

- Widely used for short-range communication
- The remote controls used on televisions, VCRs and stereos are all infrared communication.

- Cheap and easy to build
- However it does not pass through solid objects.

(c) IEEE 802.2

- IEEE 802.2 is the original name of the ISO/IEC 8802-2 standard which defines Logical Link Control (LLC) as the upper portion of the Data link layer of the OSI model.

LLC may offer three types of services:
→ Unacknowledged connectionless mode services (mandatory)
→ Connection mode services (Optional)
→ Acknowledged connectionless mode services (Optional)

7. BIT STUFFING

It is the insertion of non-information bits into data.

Applications of bit stuffing:
→ Synchronize several channels before multiplexing
→ Rate-match two single channels to each other.
→ Run length limited coding (To limit the number of consecutive bits of the same value in the data to be transmitted. A bit of the opposite value is inserted after the maximum

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allowed number of consecutive bits.

Example of bit stuffing:

Bit Sequence (without bit stuffing):
1101011111 0101111111 0101111110

Bit Sequence (with bit stuffing):
11010111110 0101111101 0101111101 10

After 5 consecutive 1-bits, a 0-bit is stuffed. Stuffed bits are marked in bold.

(8.) Dataword: 1101011

Polynomial: x^4+x^2+1

(10101)

```
10101 ) 1101011 ( 1111
        10101
        ----
         1111
         1010
         ----
          1011
          1010
          ----
             1
             0
             -
             1
```

There is no error.

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(9) Sliding window Protocol are data link layer protocol for Reliable & sequential delivery of data frames.

In one-bit sliding window protocol the size of the window is 1. So the sender transmits a frame, waits for its acknowledgement, then transmits the next frame.

Thus it uses the concept of stop and waits for the protocol. This protocol provides for full-duplex communication.

Example:

A sends (0, 1, A0) → B gets (0, 1, A0) *
B sends (0, 0, B0) ← A gets (0, 0, B0)*.
A sends (1, 0, A1) → B gets (1, 0, A1)*
B sends (1, 1, B1) ← A gets (1, 1, B1)*
A Sends (0, 1, A2) → B gets (0, 1, A2) *
B sends (0, 0, B2) ← A gets (0, 0, B2) *
A Sends (1, 0, A3) * → B gets (1, 0, A3)*
B sends (1, 1, B3)

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10. Dataword: 1010

1	0	1	P_4	0	P_2	P_1
7	6	5	4	3	2	1

$P_1 \rightarrow D_3\ D_5\ D_7$

0 1 1

Hence P_1 is 0.

$P_2 \rightarrow D_3\ D_6\ D_7$

0 0 1

Hence P_2 is 1.

$P_4 \rightarrow D_5\ D_6\ D_7$

1 0 1

Hence P_3 is 0.

Hence hamming codeword is 1010010