CN TT-1

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Q1. Explain all framing mechanisms with example.

ANS Framing is function of Data link layer that is used to seperate message from source or sender to destination or receiver or simply from all other messages to all other destinations just by adding sender address and destination address. The destination or receiver address is simply used to represent where message or packet is to go and sender or source address is simply used to help recipient to acknowledge receipt.

Frames are generally data unit of data link layer that is transmitted or transferred among various network points. It includes complete and full addressing, protocols that are essential, and information under control. Physical layers only just accept and transfer stream of bits without any regard to meaning or structure. Therefore it is upto data link layer to simply develop and recognize frame boundaries.

This can be achieved by attaching special types of bit patterns to start and end of the frame. If all of these bit patterns might accidentally occur in data, special care is needed to be taken to simply make sure that these bit patterns are not interpreted incorrectly or wrong as data frame delimiters.

Framing is simply point-to-point connection among two computers or devices that consists or includes wire in which data is transferred as stream of bits. However, all of these bits should be framed into discernible blocks of information.

METHODS OF FRAMING

There are basically four methods of framing as given below :-

1. CHARACTER COUNT : This method is rarely used and is generally required to count total number of characters that are present in frame. This is be done by using field in header. character count method ensures data link layer at the receiver or destination about total number of characters that follow, and about where the frame ends. There is disadvantage also of using this method i.e. if anyhow character count is disturbed or distorted by an error occuring during transmission, then destination or receiver might lose synchronization. The destination or receiver might also be not be able to locate or identify beginning of next frame.

2. CHARACTER STUFFING : Character stuffing is also known as byte stuffing or character-oriented framing and is same as that of bit stuffing but byte stuffing actually operates on bytes whereas bit stuffing operates on bits. In byte stuffing, special byte that is basically known as ESC (Escape character) that has predefined pattern is generally added to data section of the data stream or frame when there is message or character that has same pattern as that of flag byte.

But receiver removes this ESC and keeps data part that causes some problems or issues. In simple words, we can say that character stuffing is addition of 1 additional byte if there is presence of ESC or flag in text.

3. BIT STUFFING : Bit stuffing is also known as bit-oriented framing or bit-oriented approach. In bit stuffing, extra bits are being added by network protocol designers to data-streams It is generally insertion or addition of extra bits into transmission unit or message to be transmitted as simple way to provide and give signaling information and data to receiver and to avoid or ignore appearance of unintended or unnecessary control sequences.

It is type of protocol management simply performed to break up bit pattern that results in transmission to go out of synchronization. Bit stuffing is very essential part of transmission process in network and communication protocol. It is also required in USB.

4. PHYSICAL LAYER CODING VIOLATIONS: Encoding violation is method that is used only for network in which encoding on physical medium includes some sort of redundency. i.e, use of more than one graphical or visual structure to simply encode or represent one variable of data.

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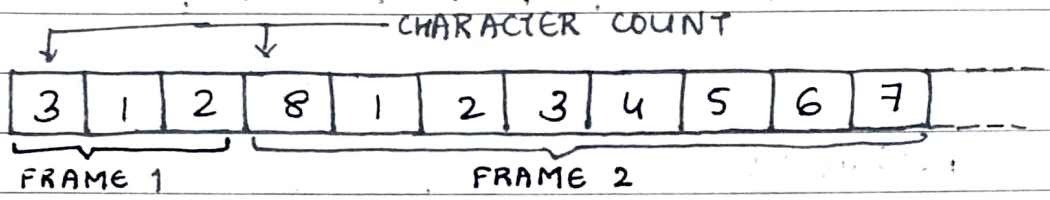
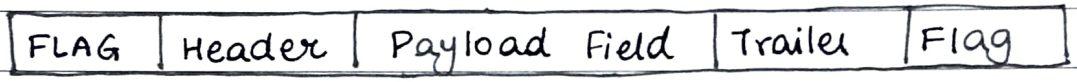
EXAMPLES

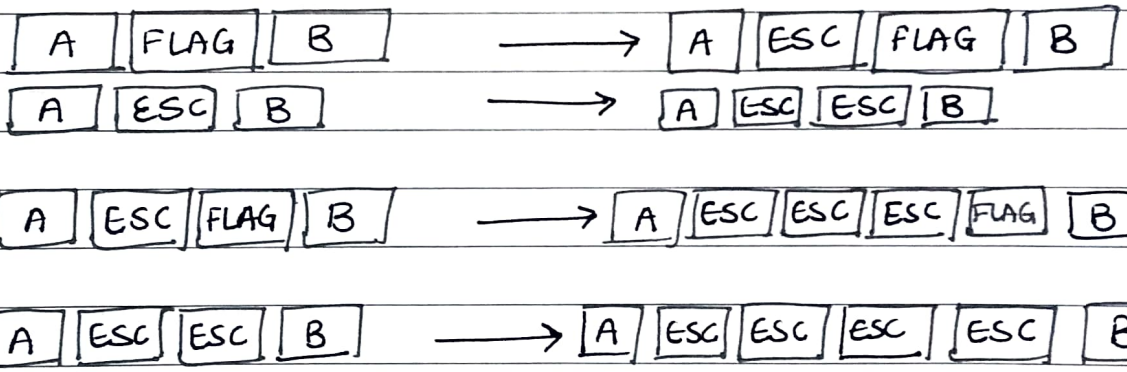
1. Character count method.



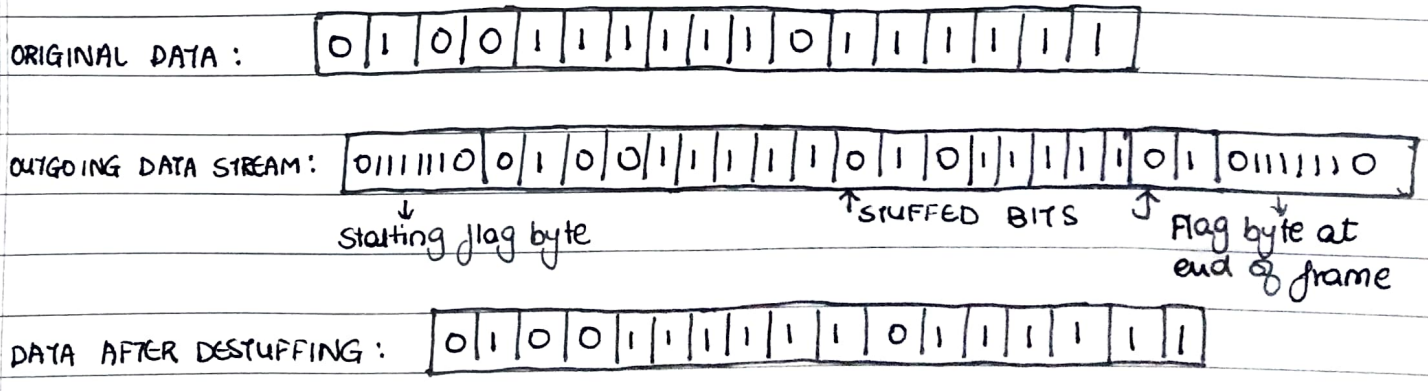
2. Character stuffing method.



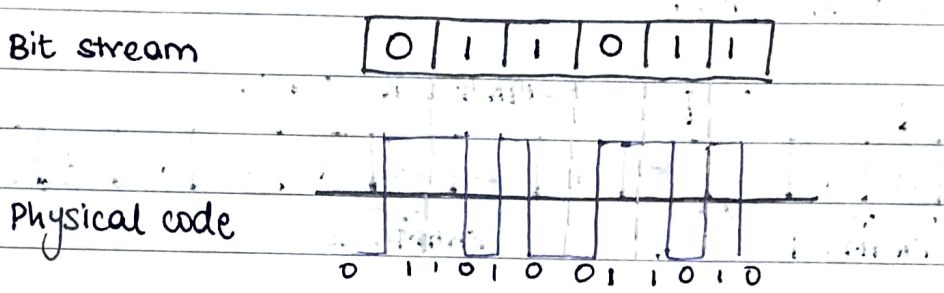
Original characters → After stuffing.



3. Bit stuffing method.



4. Physical layer coding violations



Q2 a] Calculate CRC for the message bits m(x) is 1101011010 g(x) is 10011.

Data word to be sent : 1101011010

Key : 10011

```
          1 1 0 1 0 1 1 0 1 0
        ---------------------
1 0 0 1 1 | 1 1 0 1 0 1 1 0 1 0
          | 1 0 0 1 1 ↓
          ---------------------
            1 0 0 1 1
            1 0 0 1 1
            ---------
              0 1 0 1 0
```

∴ Remainder : 1010

∴ Encoded word = Data + Remainder

= 1101011010 1010

= 1101100100

b] If message received with CRC is 100100010 g(x) = 1101. Find out whether the data received is correct or not

```
          1 0 0 1 0 0 0 1 0
        ---------------------
1 1 0 1 | 1 0 0 1 0 0 0 1 0
        | 1 1 0 1
        ---------
          1 0 0 0 0
          1 1 0 1
          -------
            1 0 1 0
            1 1 0 1
            -------
              1 1 1 0
              1 1 0 1
              -------
                1 1 1 0
                1 1 0 1
                -------
                  0 0 1 1
```

Since remainder = 11. Hence the data received is incorrect.

Correct data = 100100010 + 11

= 100100101

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Q3 Give reason why CRC is included in trailer field and not in header field.

ANS Placing the CRC at the end of a frame reduces packet latency and reduces hardware buffering requirements. On the transmit side, hardware can read and transmit bytes of the frame immediately. The transmitter calculates the CRC on the fly as data passes through, then simply append the CRC to the tail of the frame.

Consider the alternative where the CRC comes somewhere in the Ethernet header. Hardware must read and store the entire frame in order to calculate the CRC. This amounts to a large look-ahead operation and adds significantly to transmit latency and hardware cost. The situation also becomes more complex for the receiver as well.

Q4 Explain ISO-OSI reference model with the need of layering concept.

ANS
- OSI stands for OPEN SYSTEM INTERCONNECTION is a reference model that describes how information from a software application in one computer moves through a physical medium to the software application in another computer.
- OSI consists of seven layers, and each layer performs a particular network function.
- OSI model was developed by the INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) in 1984, and it is now considered as an architectural model for the inter-computer communications.

- OSI model divides the whole task into seven smaller and manageable tasks. Each layer is assigned a particular task.
- Each layer is self-contained; so that task assigned to each layer can be performed independently.

CHARACTERISTICS OF OSI MODEL:

- The OSI model is divided into two layers: upper layers and lower layers.
- The upper layer of the OSI model mainly deals with the application related issues, and they are implemented only in the software. The application layer is closest to the end user. Both the end user and the application layer interact with the software applications. An upper layer refers to the layer just above another layer.
- The lower layer of the OSI model deals with the data transport issues. The data link layer and the physical layer are implemented in hardware and software. The physical Layer is the lowest layer of the OSI model and is closest to the physical medium. The physical layer is mainly responsible for placing the information on the physical medium.

FUNCTIONS OF THE OSI LAYERS:

There are the seven OSI layers. Each layer has different functions. A list of seven layers are given below:-

1. PHYSICAL LAYER: The main functionality of the physical layer is to transmit the individual bits from one node to another node.

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It is the lowest layer of the OSI model. It establishes, maintains and deactivates the physical connection. It specifies the mechanical, electrical and procedural network interface specifications.

2. DATA-LINK LAYER: This layer is responsible for the error-free transfer of data frames. It defines the format of the data on the network. It provides a reliable and efficient communication between two or more devices. It is mainly responsible for the unique identification of each device that resides on a local network.

3. NETWORK LAYER: It is a layer 3 that manages device addressing, tracks the location of devices on the network. It determines the best path to move data from source to the destination based on the network conditions, the priority of service, and other factors. The Data Link layer is responsible for routing and forwarding the packets.

4. TRANSPORT LAYER: The transport layer is a layer 4 ensures that messages are transmitted in the order in which they are sent and there is no duplication of data. The main responsibility of the transport layer is to transfer the data completely. This layer can be termed as an end-to-end layer as it provides a point-to-point connection between source and destination to deliver the data reliably.

5. SESSION LAYER: It is a layer 3 in the OSI model. The session layer is used to establish, maintain and synchronizes the interaction between communicating devices.

6. PRESENTATION LAYER: A presentation layer is mainly concerned with the syntax and semantics of the information exchanged between the two systems. It acts as a data translator for a network. This layer is a part of the operating system that converts the data from one presentation format to another format thus the presentation layer is also known as the syntax layer.

7. APPLICATION LAYER: An application layer serves as a window for users and application processes to access network service. It handles issues such as network transparency, resource allocation, etc. An application layer is not an application, but it performs the application layer functions. This layer provides the network services to the end-users.

Qs Explain types of media.

ANS. In data communication terminology, a transmission medium is a physical path between the transmitter and the receiver. Transmission media is broadly classified into the following types:

1. GUIDED MEDIA

It is also referred to as wired or Bounded transmission media. Signals being transmitted are directed and

confined in a narrow pathway by using physical links. There are 3 major types of guided media :-

(i) TWISTED PAIR CABLE : It consists of 2 seperately insulating conductor wires wound about each other. Generally, several such pairs are bundled together in a protective sheath. They are the most widely used Transmission media. Twisted Pair is of two types :-
- Unshielded Twisted Pair (UTP)
- Shielded Twisted Pair (STP)

(ii) COAXIAL CABLE : It has an outer plastic covering 2 parallel conductors each having a seperate insulated protection cover. The coaxial cable transmits information in two modes :- Baseband mode and Broadband mode. Cable TV's and analog television networks widely use Coaxial cable.

(iii) OPTICAL FIBRE CABLE : It uses the concept of reflection of light through a core made up of glass or plastic. The core is surrounded by a less dense glass or plastic covering called the cladding. It is used for the transmission of large volumes of data.

(iv) STRIPLINE : Stripline is a transverse electromagnetic (TEM) transmission line medium. It is the earliest form of the planar transmission line. It uses a conducting material to transmit high-frequency waves it is also called a waveguide. This conducting

material is sandwiched between two layers of the ground plane which are usually shorted to provide EMI immunity

(v) MICROSTRIPLINE : In this, the conducting material is separated from the ground plane by a layer of dielectric

2 UNGUIDED MEDIA

It is also referred to as wireless or unbound transmission media. No physical medium is required for the transmission of electromagnetic signals.

There are 3 types of signals transmitted through unguided media :

(i) RADIO WAVES : These are easy to generate and can penetrate through buildings. The sending and receiving antennas need not be aligned. Frequency range : 3KHz – 1GHz.
Further categorized as (i) Terrestrial and (ii) Satellite.

(ii) MICROWAVES : It is a line of sight transmission i.e. the sending and receiving antennas need to be properly aligned with each other. The distance covered by the signal is directly proportional to the height of the antenna. Frequency range : 1GHz – 300 GHz.

(iii) INFRARED : Infrared waves are used for very short distance communication. They cannot penetrate through obstacles. This prevents interference between systems.
Frequency range : 300 GHz – 400 THz.

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Q6 Compare P2P and Client-Server architecture.

ANS:

CLIENT-SERVER NETWORK	PEER-TO-PEER NETWORK
• In client-server network, clients and server are differentiated, Specific server and clients are present.	• In Peer-to-Peer Network, Clients and server are not differentiated.
• Client-Server Network focuses on information sharing.	• While Peer-to-Peer Network focuses on connectivity.
• In Client-Server Network, Centralized server is used to store the data.	• While in Peer-to-Peer Network, Each peer has its own data.
• In Client-Server Network, Server respond the services which is request by client	• While in Peer-to-Peer Network, Each and every node can do both request and respond for the services
• Client-Server Network are costlier than Peer-to-Peer Network.	• While Peer-to-Peer Networks are less costlier than Client-Server Network.
• Client-Server Network are more stable than Peer-to-Peer Network.	• While Peer-to-Peer Network are less stable if number of peer is increased.
• Client-Server Network is used for both small and large networks.	• While Peer-to-Peer Network is generally suited for small networks with fewer than 10 computers.