1. Explain about DLC Services ?

DLC Services :-

The data link control (DLC) deals with procedures for communication between two adjacent nodes - node-to-node communication - no matter whether the link is dedicated or broadcast. Data link control functions in the include framing and flow and error control.

Framing :- The data-link layer, needs to pack bits into frames, so that each frame is distinguishable from another. Framing in the data-link layer separates a message from one source to a distination by adding a sender address and a destination address. The destination address defines where the packet is to go; the sender address helps the receipient acknowledge the receipt. When a message is carried in one very large frame, even a single-bit error would require the retransmission of the whole frame. When a message is divided into smaller frames, a single bit efforts only that small frame.

Character-Oriented Framing : To separate one frame from next, an 8 bit flag is added at the beginning and the end of a frame. The flag, a composed of protocol-dependent special characters, signals the state or end of a frame.

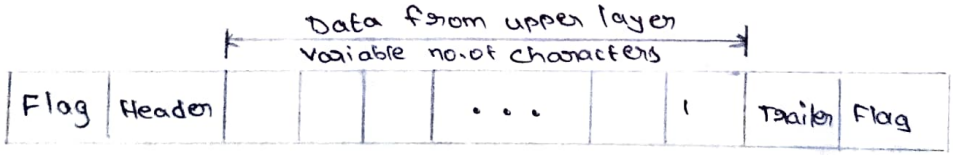


Fig : A frame in a character-oriented Protocol.

Byte stuffing :- A special byte is added to the data section of frame when there is a character with same pattern as the flag. The data section is stuffed with an extra byte. This byte is usually called the escape character (ESC) and has a predefined bit pattern. Whenever the receiver encounters the ESC character, it removes it from the data section and treats the next character as data, not as delimiting flag.

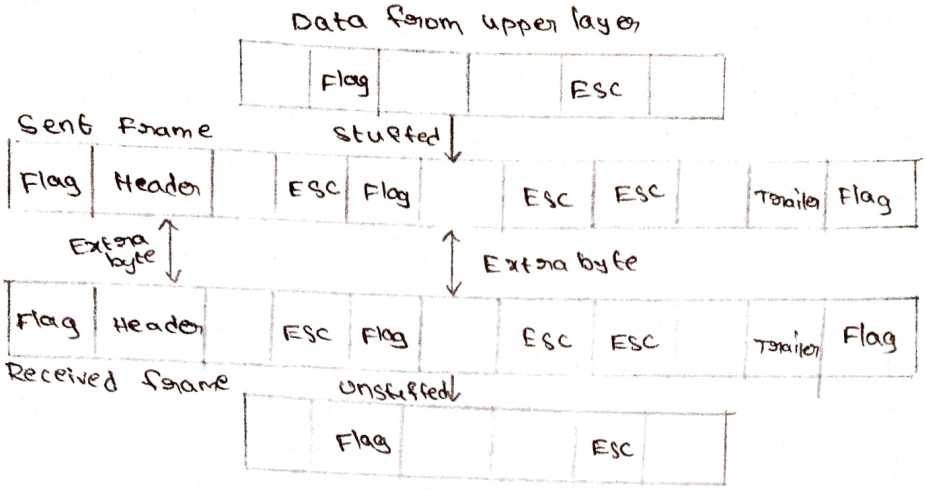


fig :- Byte Stuffing And Unstuffing

Bit-Oriented Framing :-

Bit stuffing is the process of adding one extra 0 whenever five consecutive 1s follow a 0 in the data, so that the receiver does not mistake the pattern 01111110 for a flag.

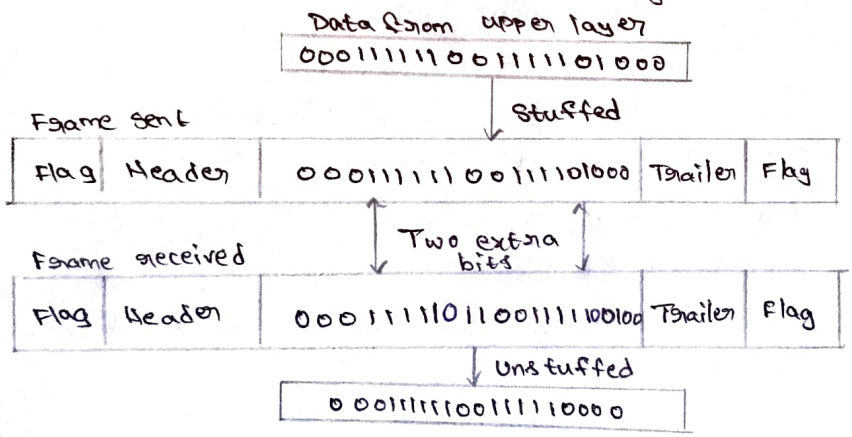


Fig :- Bit Stuffing And Unstuffing.

Flow And Error Control :-

If the items are produced faster than they can be consumed, the consumer can be overwhelmed and may need to discard some items. Flow control is related to the first issue. We need to prevent losing the data items at the consumer site.

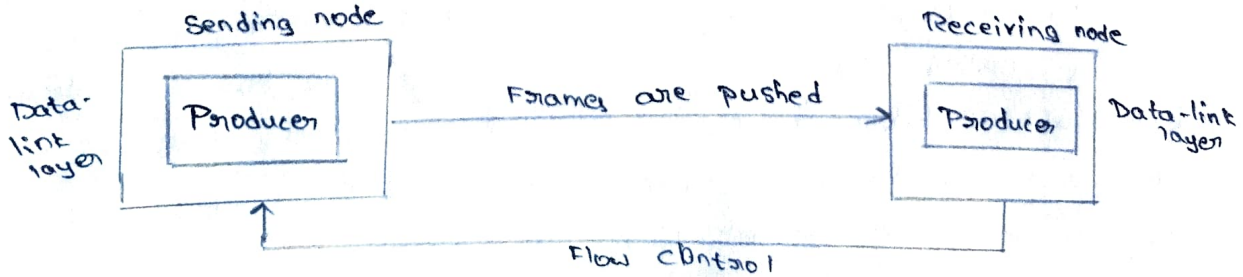


Fig :- Flow control at the Data-link layer

Buffers : One of the solutions is normally to use two buffers; one at the sending data link layer and the other at the receiving data link layer. When the buffer one receiving data-link layer is full, it informs the sending data-link layer to stop pushing frames.

Error Control :- Error control at the data link is normally very simple and implemented using one of CRC is added to the frame header by sender and checked by the receiver.

→ In first method, if frame is corrupted, it is silently discarded. This method is used mostly in wired LANS such as Ethernet.

→ In second method, if frame is corrupted, it is silently discarded; if it is not corrupted, an acknowledgement is sent to the sender.

2. Do Explain about Data link layer protocols ?

Simple Protocol : Our first protocol is a simple protocol with neither flow nor control. We assume that receiver can immediately handle any frame it receives.

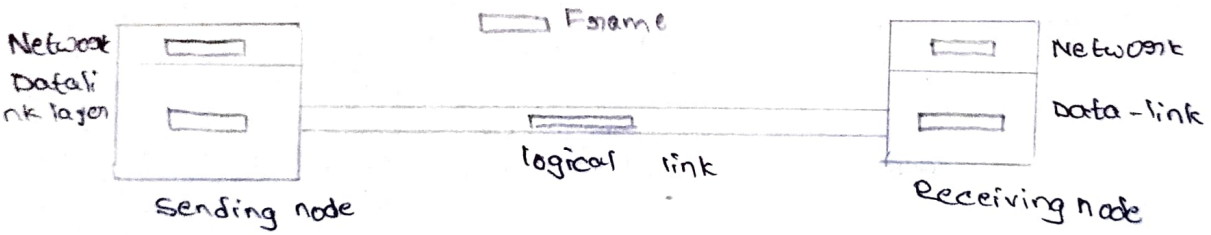


Fig:- Simple Protocol

The data-link layer at sender gets a packet from its network layer, makes a frame out of it, sends the frame.

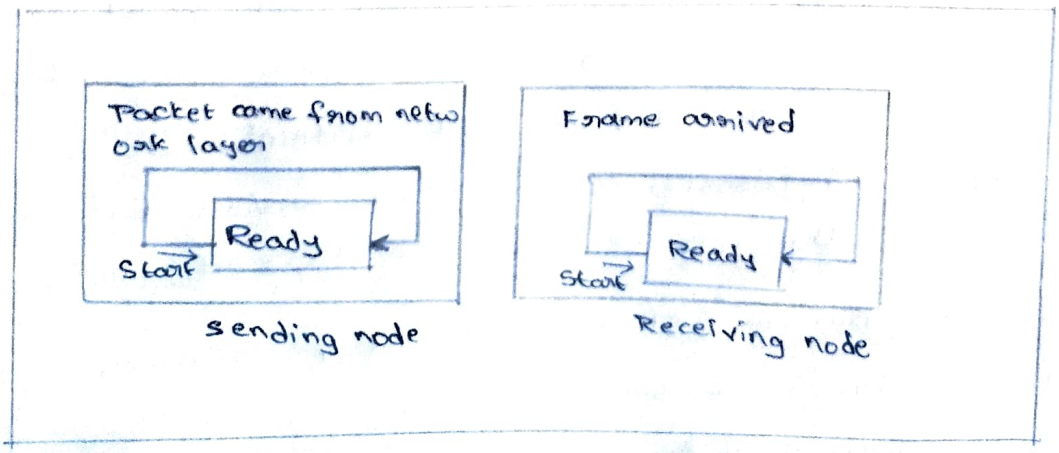


fig:- FSM of Simple Protocol

Stop-And-Wait Protocol :-

Stop and wait protocol uses both flow and error control. In this protocol, the sender sends one frame at a time and waits for an acknowledgement before sending the next one. To detect corrupted frames, we need to add a CRC each data frame.

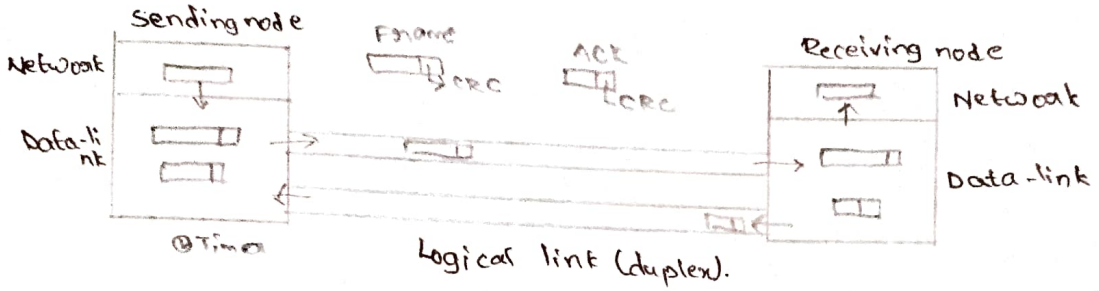


Fig :- Stop and wait Protocol

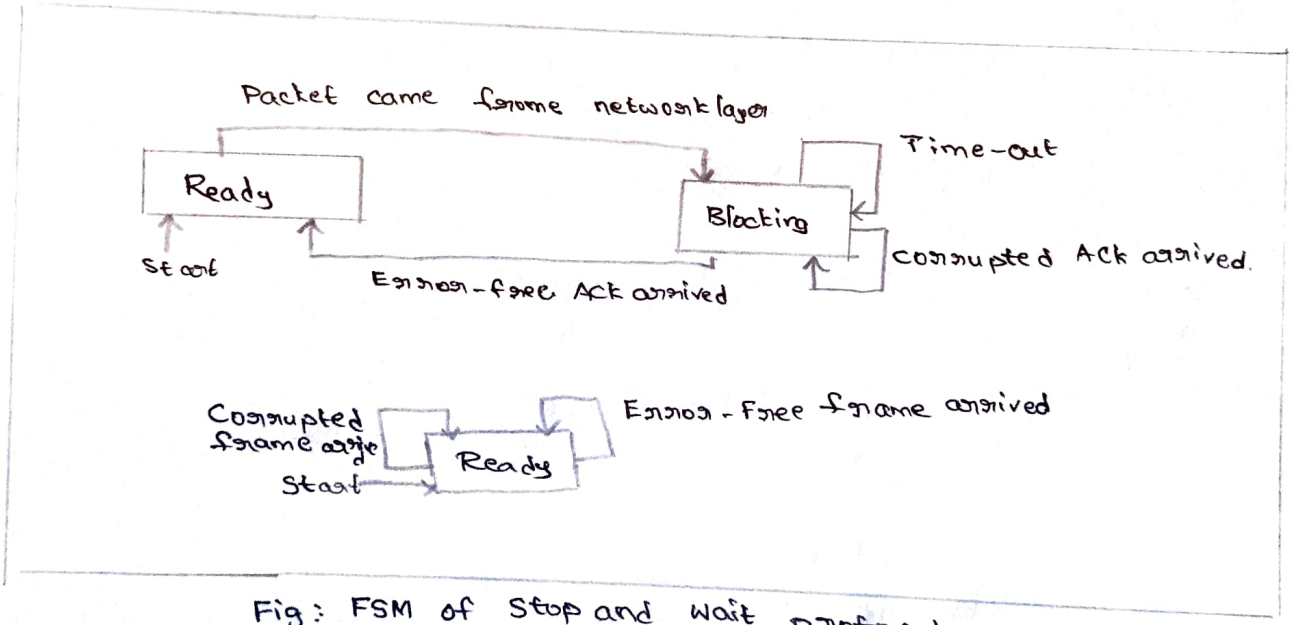


Fig: FSM of Stop and wait protocol.

HDLC :- High-level Data link Control (HDLC) is a bit-oriented protocol for communication over point to point and multipoint tasks. It implements the stop and wait protocol.

Configurations and Transfer Modes : HDLC provides two common transfer modes that can be used in different configurations.

We have one primary station and multiple secondary stations. A primary station can send commands; a secondary station can only respond.

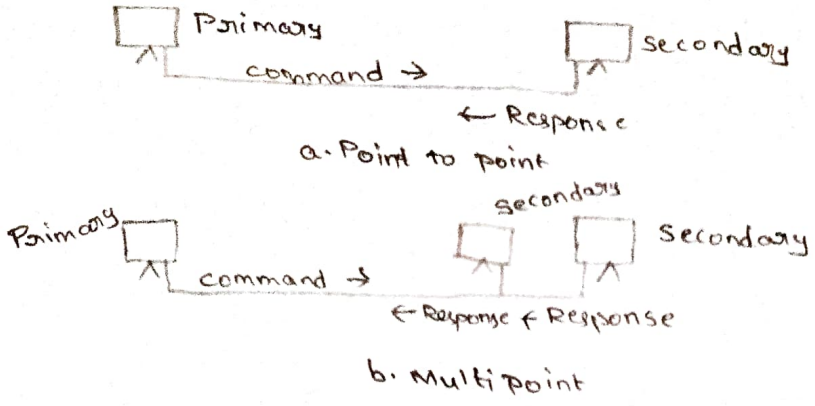


Fig :- Normal Response Mode

In ABM, the configuration is balanced. The link is point-to-point, and each station can functions as a primary and secondary.

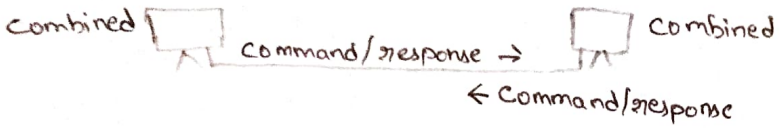
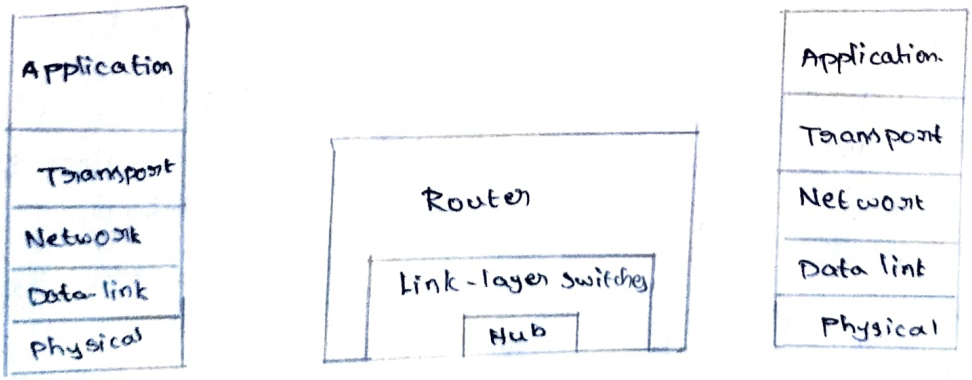


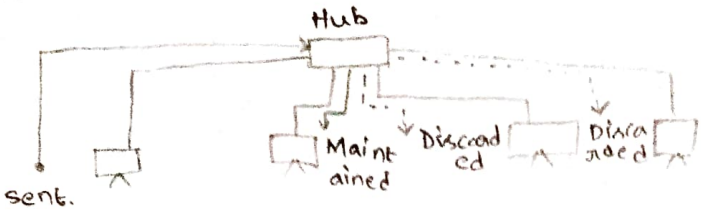
Fig :- Asynchronocus Balanced Mode.

3. Explain about connectivity devices & virtual LAN's.

Connecting devices :- Connecting devices are used to connect hosts together to make a network or to connect networks together to make an internet. Three kinds of connecting devices : Hubs, link layer switches, and routers.



Hub :- A Hub is a device that operates only in physical layer. A repeater recieves a signal and, before it becomes too weak or corrupted, regenerates and retimes the original bit pattern.

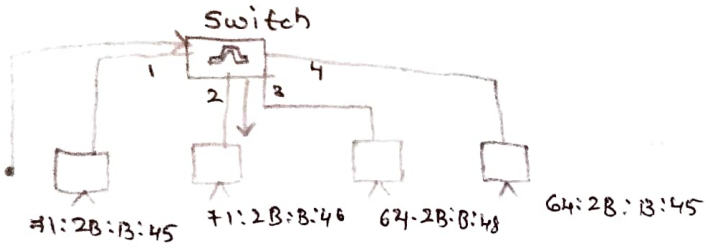


They just generate the corrupted bits and send them out from every port.

Link Layer Switches :-

A link layer switch operates in both physical and data-link layers. As a link layer device the link layer switch can check MAC address contained in the frame.

Filtering :- The functionality between a link layer switch and a hub is a link layer switch has filtering capability.



Switching table.

Address	Port
71:2B:13:45	1
71:2B:13:46	2
64:2B:48:83	3
64:2B:13:45	4

Transparent switch is a switch in which stations are completely unware of switches uncesary.

A transparent switch must correctly forward the frames, as discused in the previous section.

Routers :

A router is a three layer device ; it operates in the physical, data-link and network layers. Theere are 3 major differences between router and a repeater or a switch.

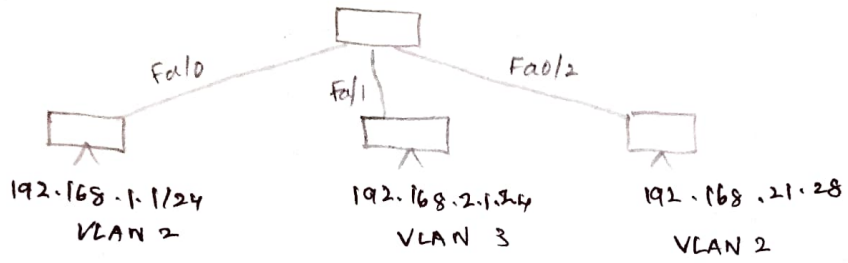
1. A router has a physical and logical address for each of its interfaces.
2. A router acts only on those packets in which link layer destination address matches the address.
3. A router changes the link layer address of the packet when it forwards the packet.

Virtual LAN :-

Virtual LAN is a concept in which we can divide the devices logically on layer 2 layer 3 devices divide the broadcoast domain but the broadcast domain can divided by switches using the concept of VLAN.

VLAN ranges :-

1. VLAN 0, 4095 : These are reserved VLAN which cannot be seen or used
2. VLAN 1 : It is default VLAN of switches.
3. VLAN 2 - 1001 : This is a normal VLAN range.
4. VLAN 1002 - 1005 : These are cisco defaults for fddi and token rings.
5. VLAN 1006 - 4094 : This is the extended range of VLAN



Advantanges :-

1. Performance :- VLANs make the broadcast or multicast packet will go to the intended user only.
2. Formation of virtual grooups.
3. Security.

Disadvantages :-

1. Complexity : VLANs can be complex to configure and manage.
2. Limited scalability : VLANs are limited by no. of VLAN IDs.
3. Limited Security : VLANs do not provide complete security.
4. Limited mobility :
5. Cost : Implementing and maintaining VLANs can be costly.