Centre for Differently Abled Persons
Bharathidasan University

III BCA – VI SEMESTER

DATA COMMUNICATION AND NETWORKS
(20UCA6CC8)
UNIT - III

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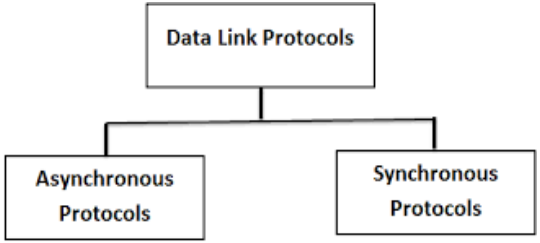
UNIT - III

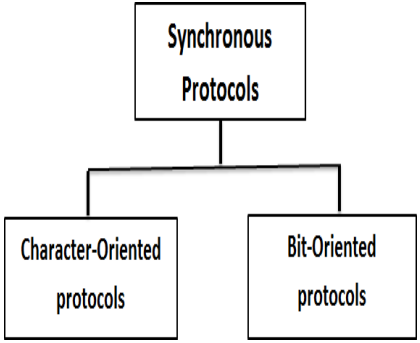
DATA LINK PROTOCOLS



- Data-link protocols specify how devices detect and recover from such collisions, and may provide mechanisms to reduce or prevent them.
- Examples of data link protocols are Ethernet for local area networks (multi-node), the Point-to-Point Protocol (PPP), HDLC and ADCCP for point-to-point (dual-node) connections

SYNCHRONOUS PROTOCOLS

- A "data is sent in a continuous stream at constant rate".
- Synchronous communication requires that the clocks in the transmitting and receiving devices are synchronized– running at the same rate – so the receiver can sample the signal at the same time intervals used by the transmitter
- Synchronous protocols allow faster transmission than asynchronous protocols.



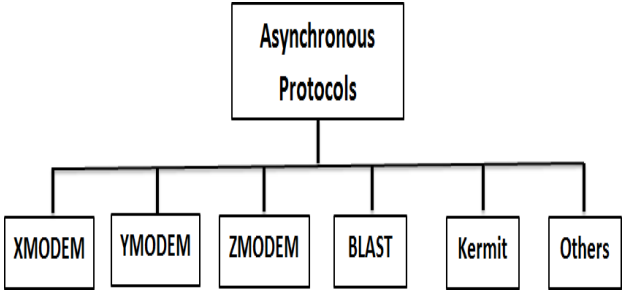
BIT-ORIENTED PROTOCOLS

- In character-Oriented protocols, bits are grouped into predefined patterns forming characters.
- Bit-Oriented protocols can pack more information into shorter frames
- It avoids the transparent or problem of character information
- It is no under that over the last two decade many different Bit-Oriented protocols have been developed.

Character - Oriented Protocols

- The character-Oriented protocols are not as efficient as bit-Oriented protocols and therefore are now seldom used.
- They are however is easy to comprehend and employ the same logic and organization as the bit-Oriented protocols.
- An understanding of character-Oriented protocols provides and essential
- foundation for an examination of bit-oriented protocols.

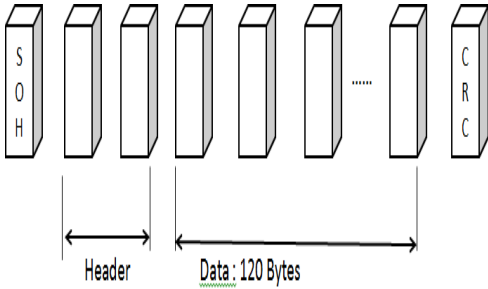
ASYNCHRONOUS PROTOCOLS



- Asynchronous protocols are not complex and are inexpensive to implement.
- In Asynchronous transmission a data unit is transmitted with no timing coordination between sender and receiver.
- A receiver does not need to know exactly when a data unit is sent, it only needs to recognize the beginning and the end of the unit.
- This is accomplished by using extra bits (start and stop bits) to frame the data unit.
- Asynchronous protocols used primarily in modems, feature start and stop bits and variable length gaps between characters. A variety of Asynchronous DLL protocols are

XMODEM

- In 1979 Ward Christiansen designed a file transfer
- protocolfor telephone-line communication between PCs.
- This protocol, now known as XMODEM, is a half-duplex stop-and-wait ARQ protocol.



YMODEM

- YMODEM is a protocol similar to XMODEM, with the following major differences :
  - The data unit is 1024 bytes and 2 CANs are sent to abort a transmission.
  - ITU-T CRC-16 is used for error checking.
  - Multiple files can be sent simultaneously.

ZMODEM

- It is a newer protocol combining features of both XMODEM and YMODEM.

BLAST

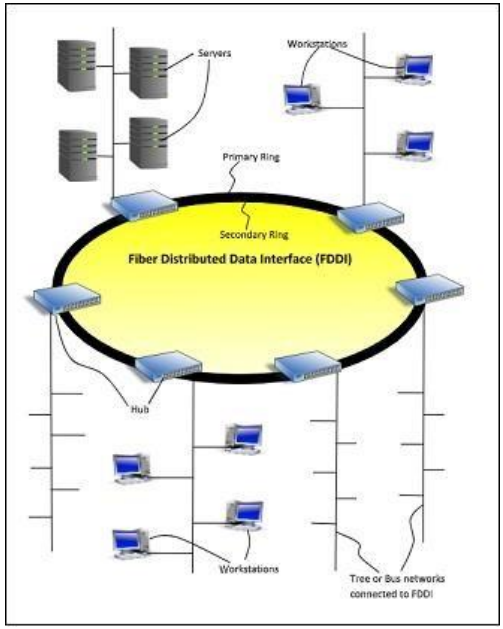
- Blocked Asynchronous transmission (BLAST) is more powerful than XMODEM.
- It is full-duplex with sliding window flow control & allows the transfer of data files.

Kermit

- Kermit, designed at Columbia University, is currently the most widely used synchronous protocol.
- This file transfer protocol is similar in operation to XMODEM, whith the sender waiting for a NAK before it starts transmission.

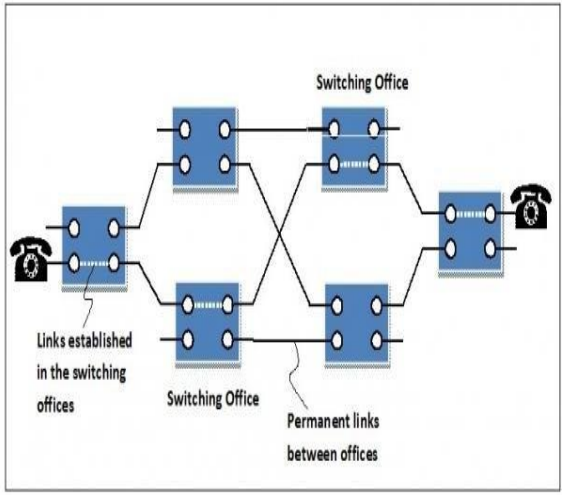
FDDI (Fiber Distributed Data Interface)

- Fiber Distributed Data Interface (FDDI) is a standard for data transmission in a local area network.
- Fiber Distributed Data Interface (FDDI) is a set of ANSI and ISO standards for transmission of data in local area network (LAN) over fiber optic cables.
- It is applicable in large LANs that can extend up to 200 kilometers in diameter.



- The emerging Fibre Distributed Data Interface (FDDI) uses a dual counter-rotating ring topology based on optical fibre links.
- Normally one ring is active, and the second one only stands by to increase reliability
- Fiber Distributed Data Interface, or FDDI, is a high- speed network technology which runs at 100 Mbps over fiber-optic cabling, often used for network backbones in
- a local area network (LAN) or metropolitan area network (MAN)

CIRCUIT SWITCHING



- Circuit switching is the most familiar technique used to build a communications network.
- It is used for ordinary telephone calls & allows communications equipment and circuits, to be shared among users.
- Each user has sole access to a circuit during network use.
- In circuit switching network resources (bandwidth) is divided into pieces and bit delay is constant during a connection.
- The dedicated path/circuit established between sender and receiver provides a guaranteed data rate.

Data can be transmitted without any delays once the circuit is established.

Phases of Circuit Switch Connection

- Circuit Establishment :
- Data Transfer :
- Circuit Disconnection :

Advantages

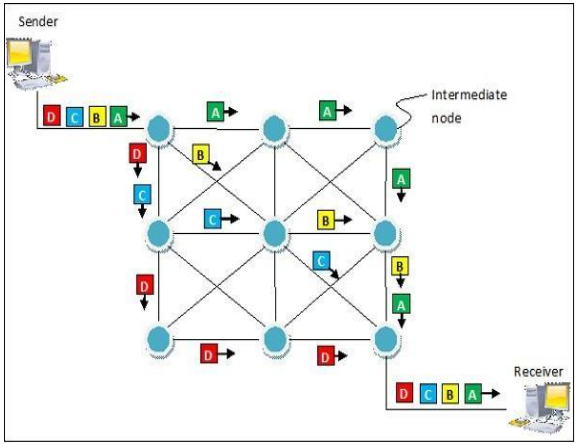
- It is suitable for long continuous transmission, since a continuous transmission route is established, that remains throughout the conversation.
- The dedicated path ensures a steady data rate of communication.

Disadvantages

- Circuit switching establishes a dedicated connection between the end parties. This dedicated connection cannot be used for transmitting any other data, even if the data load is very low.
- Bandwidth requirement is high even in cases of low data volume.

PACKET SWITCHING

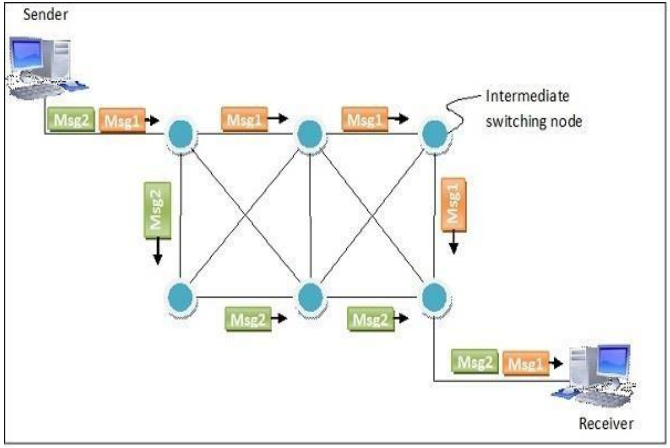
- Packet switching is the transfer of small pieces of data across various networks.
- These data chunks or "packets" allow for faster, more efficient data transfer.
- Often, when a user sends a file across a network, it gets transferred in smaller data packets, not in one piece



- Packet switching may be classified into connectionless packet switching, also known as datagram switching, and connection-oriented packet switching, also known as virtual circuit switching.
- Examples of connectionless systems are Ethernet, Internet Protocol (IP), and UDP.
- There are two types of packet switching, connectionless (datagram switching) and connection-oriented (virtual circuit switching).
- The difference is in how address information is conveyed.
- The IP protocol provides fragmentation and reassembly of datagrams and error reporting.

- **Advantages**
  - Delay in delivery of packets is less, since packets are sent as soon as they are available.
  - Switching devices don't require massive storage, since they don't have to store the
  - entire messages before forwarding them to the next node.
- **Disadvantages**
  - They are unsuitable for applications that cannot afford delays in communication like high quality voice calls.
  - Packet switching high installation costs.
  - They require complex protocols for delivery.

MESSAGE SWITCHING



- Message switching is a connectionless network switching technique where the entire message is routed from the source node to the destination node, one hop at a time.
- It was a precursor of packet switching.

Process

- Packet switching treats each message as an individual unit.
- Before sending the message, the sender node adds the destination address to the message. It is then delivered entirely to the next intermediate switching node.
- The intermediate node stores the message in its entirety, checks for transmission errors, inspects the destination address and then delivers it to the next node &
- continues till the message reaches the destination.
- In the switching node, the incoming message is not discarded if the required outgoing circuit is busy.

Advantages

- Sharing of communication channels ensures better bandwidth usage.
- It reduces network congestion due to store and forward method. Any switching node can store the messages till the network is available.
- Broadcasting messages requires much less bandwidth than circuit switching.

Disadvantages

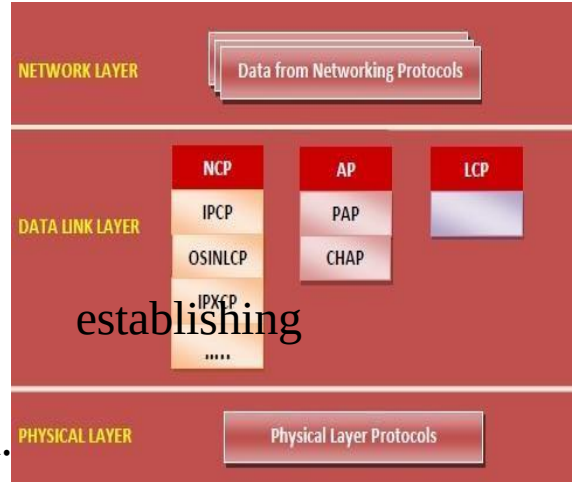
- In order to store many messages of unlimited sizes, each intermediate switching node requires large storage capacity.
- Store and forward method introduces delay at each switching node. This renders it unsuitable for real time applications.

POINT TO POINT PROTOCOL

- Point - to - Point Protocol (PPP) is a communication protocol of the data link layer that is used to transmit multiprotocol data between two directly connected (point-to-point) computers.
- It is a byte - oriented protocol that is widely used in broadband communications having heavy loads and high speeds.

Services Provided by PPP

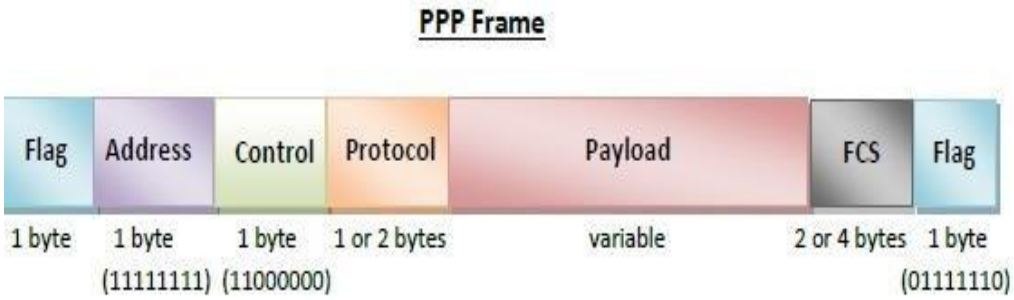
- The main services provided by Point - to - Point Protocol are –
- Defining the frame format of the data to be transmitted.
- Defining the procedure of establishing link between two points and exchange of data.
- Stating the method of encapsulation of network layer data in the frame.
- Stating authentication rules of the communicating devices.
- Providing address for network communication & connections over multiple links.
- Supporting a variety of network layer protocols by providing a range os services.



Components of PPP

- Point - to - Point Protocol is a layered protocol having three components −
  - **Encapsulation Component**
    - It encapsulates the datagram so that it can be transmitted over the specified physical layer

- **Link Control Protocol (LCP)**
  - It is responsible for establishing, configuring, testing, maintaining and terminating links for transmission.
- **Authentication Protocols (AP)**
  - These protocols authenticate endpoints for use of services.



Byte Stuffing in PPP Frame

- Byte stuffing is used is PPP payload field whenever the flag sequence appears in the message, so that the receiver does not consider it as the end of the frame.
- The escape byte, 01111101, is stuffed before every byte that contains the same byte as the flag byte or the escape byte.
- The receiver on receiving the message removes the escape byte before passing it onto the network layer.

THANK YOU