CO - 2

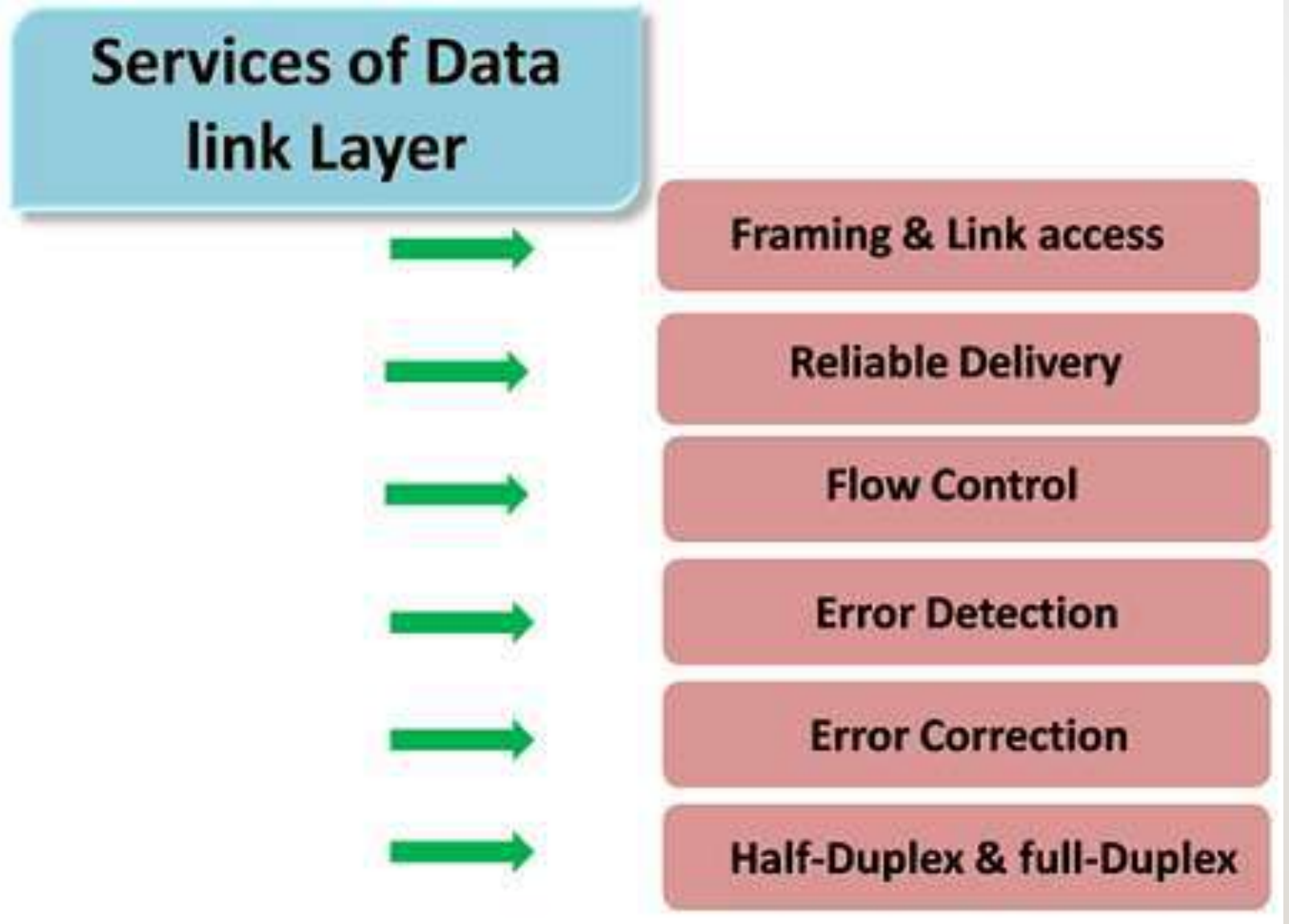
COURSE NAME : SYSTEM DESIGN AND INTRODUCTION TO CLOUD

COURSE CODE : 23AD2103A

TOPICS : DATA LINK LAYER: DESIGN ISSUES, FRAMING

SESSION DESCRIPTION

- Data link layer: Design issues, Framing


Services of Data link Layer
Framing & Link access
Reliable Delivery
Flow Control
Error Detection
Error Correction
Half-Duplex & full-Duplex

DESIGN ISSUES IN DATA LINK LAYER

- Data-link layer is the second layer after the physical layer. The data link layer is responsible for maintaining the data link between two hosts or nodes.
- Before going through the design issues in the data link layer. Some of its sub-layers and their functions are as following below.
- **The data link layer is divided into two sub-layers :**
- **Logical Link Control Sub-layer (LLC) –**
- Provides the logic for the data link, Thus it controls the synchronization, flow control, and error checking functions of the data link layer. Functions are –
- Error Recovery.
- It performs the flow control operations.
- User addressing.

DESIGN ISSUES IN DATA LINK LAYER

- **Media Access Control Sub-layer (MAC) –**
- It is the second sub-layer of data-link layer. It controls the flow and multiplexing for transmission medium. Transmission of data packets is controlled by this layer. This layer is responsible for sending the data over the network interface card.
- **Functions are –**
- To perform the control of access to media.
- It performs the unique addressing to stations directly connected to LAN.
- Detection of errors.

DESIGN ISSUES WITH DATA LINK LAYER ARE

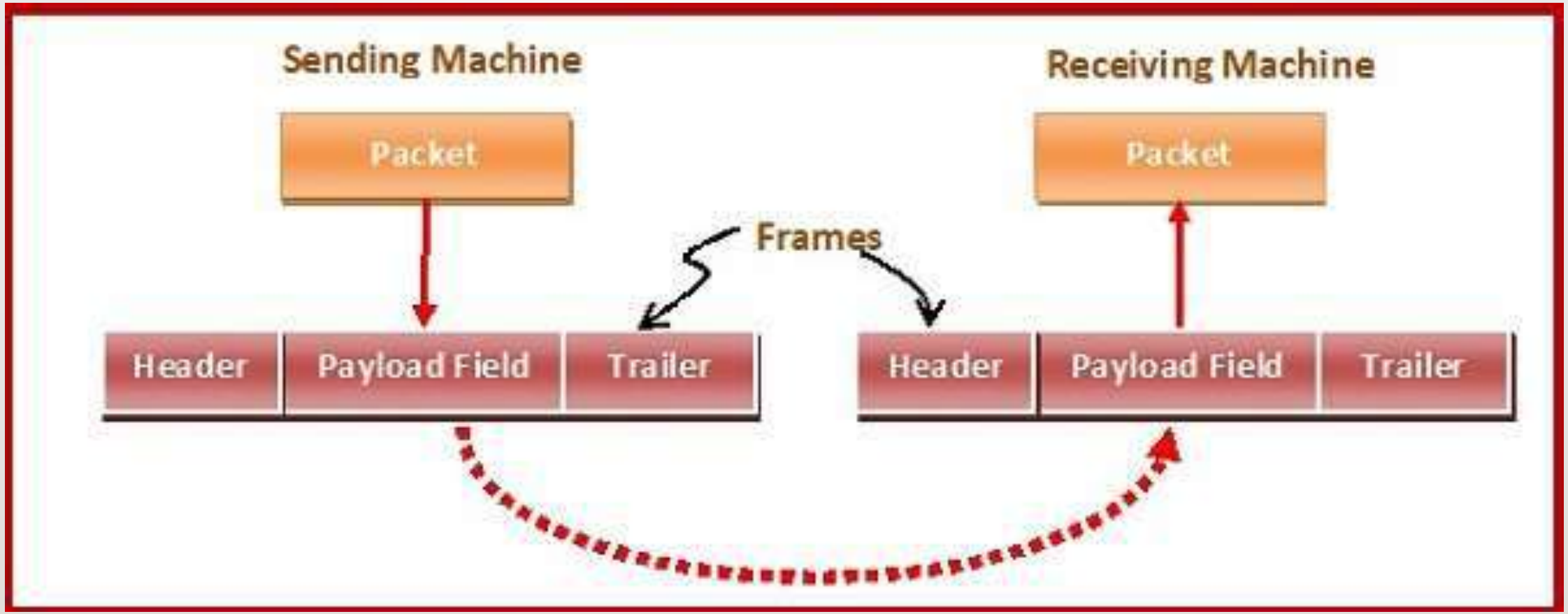
- **Services provided to the network layer –**
- The data link layer act as a service interface to the network layer. The principle service is transferring data from network layer on sending machine to the network layer on destination machine. This transfer also takes place via DLL (Data link-layer).
- **It provides three types of services:**
- Unacknowlwdged and connectionless services.
- Acknowledged and connectionless services.
- Acknowledged and connection-oriented services

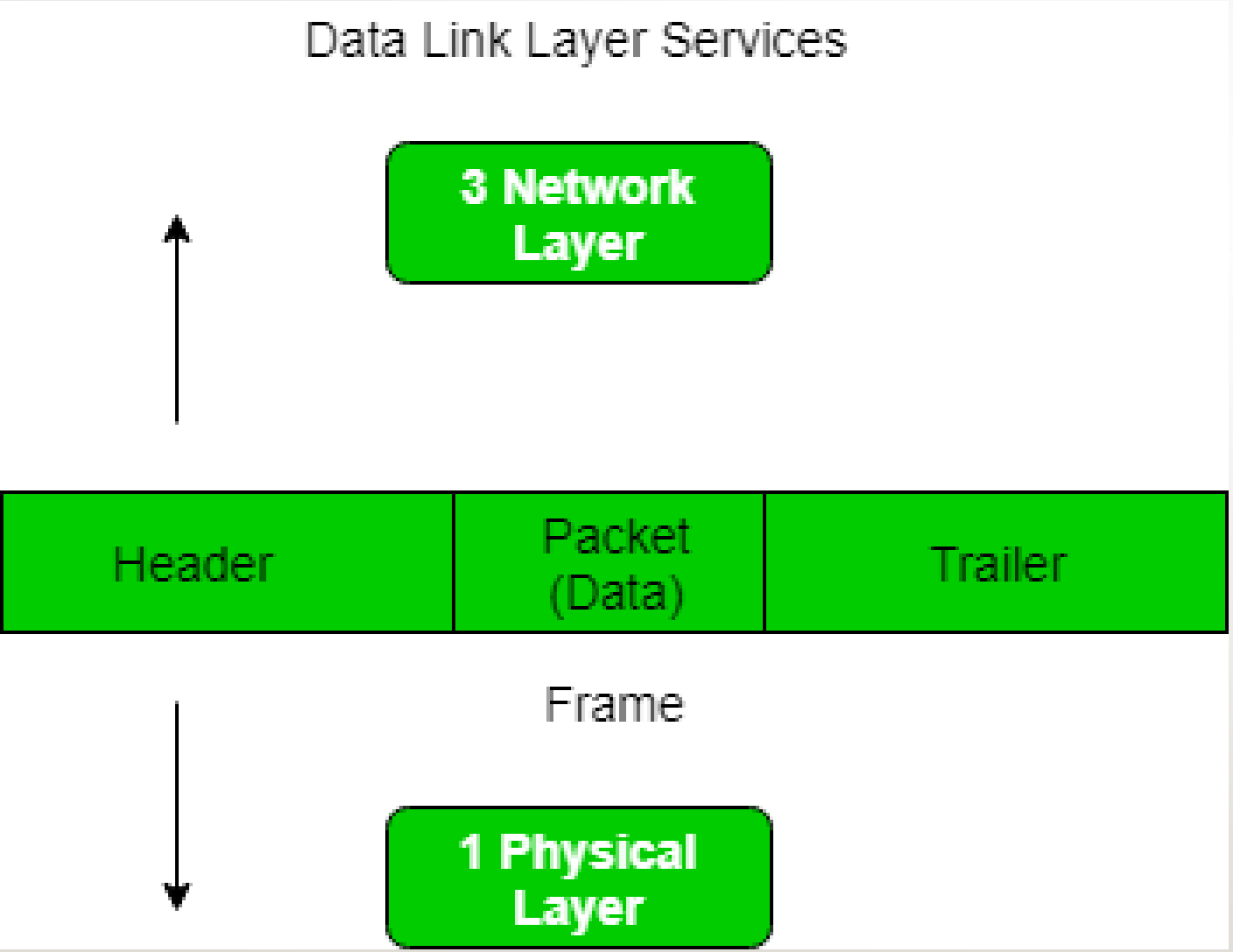
- **Unacknowledged and connectionless services.**
- Here the sender machine sends the independent frames without any acknowledgement from the sender.
- There is no logical connection established.
- **Acknowledged and connectionless services.**
- There is no logical connection between sender and receiver established.
- Each frame is acknowledged by the receiver.
- If the frame didn't reach the receiver in a specific time interval it has to be sent again.
- It is very useful in wireless systems.
- **Acknowledged and connection-oriented services**
- A logical connection is established between sender and receiver before data is trimester.
- Each frame is numbered so the receiver can ensure all frames have arrived and exactly once.

- **Frame synchronization –**
- The source machine sends data in the form of blocks called frames to the destination machine. The starting and ending of each frame should be identified so that the frame can be recognized by the destination machine.
- **Flow control –**
- Flow control is done to prevent the flow of data frame at the receiver end. The source machine must not send data frames at a rate faster than the capacity of destination machine to accept them.
- **Error control –**
- Error control is done to prevent duplication of frames. The errors introduced during transmission from source to destination machines must be detected and corrected at the destination machine.

FRAMING IN DATA LINK LAYER

- Frames are the units of digital transmission, particularly in computer networks and telecommunications. Frames are comparable to the packets of energy called photons in the case of light energy. Frame is continuously used in Time Division Multiplexing process.
- Framing is a point-to-point connection between two computers or devices consisting of a wire in which data is transmitted as a stream of bits. However, these bits must be framed into discernible blocks of information. Framing is a function of the data link layer. It provides a way for a sender to transmit a set of bits that are meaningful to the receiver.


Sending Machine
Receiving Machine
Packet
Packet
Frames
Header
Payload Field
Trailer
Header
Payload Field
Trailer



The process of dividing the data into frames and reassembling it is transparent to the user and is handled by the data link layer.

Framing is an important aspect of data link layer protocol design because it allows the transmission of data to be organized and controlled, ensuring that the data is delivered accurately and efficiently.

PROBLEMS IN FRAMING

- **Detecting start of the frame:** When a frame is transmitted, every station must be able to detect it.
- **How does the station detect a frame:** Every station listens to link for SFD pattern through a sequential circuit.
- **Detecting end of frame:** When to stop reading the frame.
- **Handling errors:** Framing errors may occur due to noise or other transmission errors, which can cause a station to misinterpret the frame.
- **Framing overhead:** Every frame has a header and a trailer that contains control information such as source and destination address, error detection code, and other protocol-related information.
- **Framing incompatibility:** Different networking devices and protocols may use different framing methods, which can lead to framing incompatibility issues.

THANK YOU

Team – System Design & Introduction to Cloud