Framing Methods
(Data Link Layer)

- In the Physical Layer, data transmission involves synchronised transmission of bits from the source to the destination. The data link layer packs these bits into frames.

- Data Link Layer takes the packets from the Netmork Layer and encapsulates them into frames. If the frame size becomes too large, then the packet may be divided into small sized frames. Smaller sized frames makes flow control and error control more efficient.

- Then, it sends each frame bit-by-bit on the hardware. At receiver's end, data link layer picks up signals from hardware and assembles them into frames.

Problems in Framing:

- **Detecting start of the frame:** When a frame is transmitted, every station must be able to detect it. Station detects frames by looking out for a special sequence of bits that marks the beginning of the frame i.e. **SFD (Starting Frame Delimiter)**.

- **How does the station detect a frame:** Every station listens to link for SFD pattern through a sequential circuit. If SFD is detected, sequential circuit alerts station. Station checks destination address to accept or reject frame.

- **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. Therefore, error detection and correction mechanisms, such as **cyclic redundancy check (CRC)**, are used to ensure the integrity of 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. This overhead reduces the available bandwidth for data transmission, especially for **small-sized frames**.

- **Framing incompatibility:** **Different networking devices and protocols may use different framing methods, which can lead to framing incompatibility issues. For example, if a device using one framing method sends data to a device using a different framing method, the receiving device may not be able to correctly interpret the frame.**

- **Framing synchronization:** **Stations must be synchronized with each other to avoid collisions and ensure reliable communication. Synchronization requires that all stations agree on the frame boundaries and timing, which can be challenging in complex networks with many devices and varying traffic loads.**

- **Framing efficiency:** **Framing should be designed to minimize the amount of data overhead while maximizing the available bandwidth for data transmission. Inefficient framing methods can lead to lower network performance and higher latency.**

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