

What is bit stuffing in
computer networks?

Definition

- ▶ Bit stuffing is the mechanism of inserting one or more non-information bits into a message to be transmitted, to break up the message sequence, for synchronization purpose.

Purpose of Bit Stuffing

- ▶ In Data Link layer, the stream of bits from the physical layer is divided into data frames.
- ▶ The data frames can be of fixed length or variable length. In variable - length framing, the size of each frame to be transmitted may be different. So, a pattern of bits is used as a delimiter to mark the end of one frame and the beginning of the next frame.
- ▶ However, if the pattern occurs in the message, then mechanisms needs to be incorporated so that this situation is avoided.

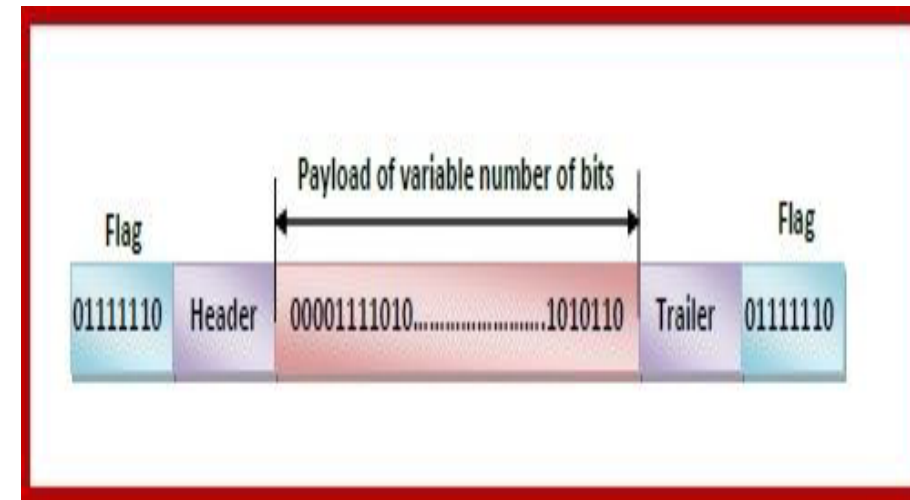


The two common approaches are

- ▶ Byte - Stuffing – A byte is stuffed in the message to differentiate from the delimiter. This is also called character-oriented framing.
- ▶ Bit - Stuffing – A pattern of bits of arbitrary length is stuffed in the message to differentiate from the delimiter. This is also called bit - oriented framing.

Frame in a Bit - Oriented Protocol

- ▶ In bit-oriented protocols, the message is coded as a sequence of bits, which are interpreted in the upper layers as text, graphics, audio, video etc. A frame has the following parts –
- ▶ **Frame Header** – It contains the source and the destination addresses of the frame.
- ▶ **Payload field** – It contains the message to be delivered.
- ▶ **Trailer** – It contains the error detection and error correction bits.
- ▶ **Flags** – A bit pattern that defines the beginning and end bits in a frame. It is generally of 8-bits. Most protocols use the 8-bit pattern 01111110 as flag.



Bit Stuffing Mechanism

- ▶ In a data link frame, the delimiting flag sequence generally contains six or more consecutive 1s. In order to differentiate the message from the flag in case of the same sequence, a single bit is stuffed in the message. Whenever a 0 bit is followed by five consecutive 1bits in the message, an extra 0 bit is stuffed at the end of the five 1s.
- ▶ When the receiver receives the message, it removes the stuffed 0s after each sequence of five 1s. The un-stuffed message is then sent to the upper layers.

