FRAMING
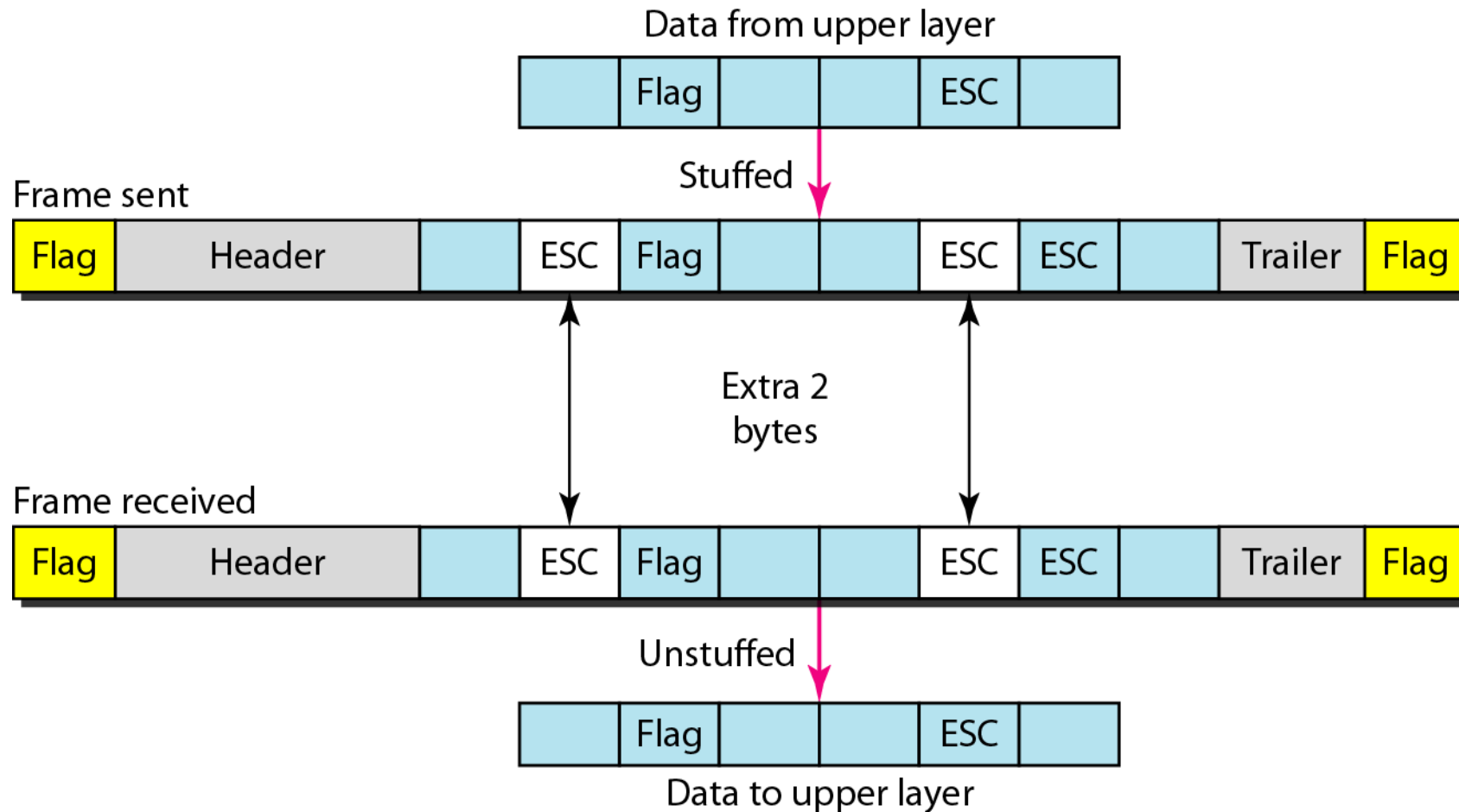
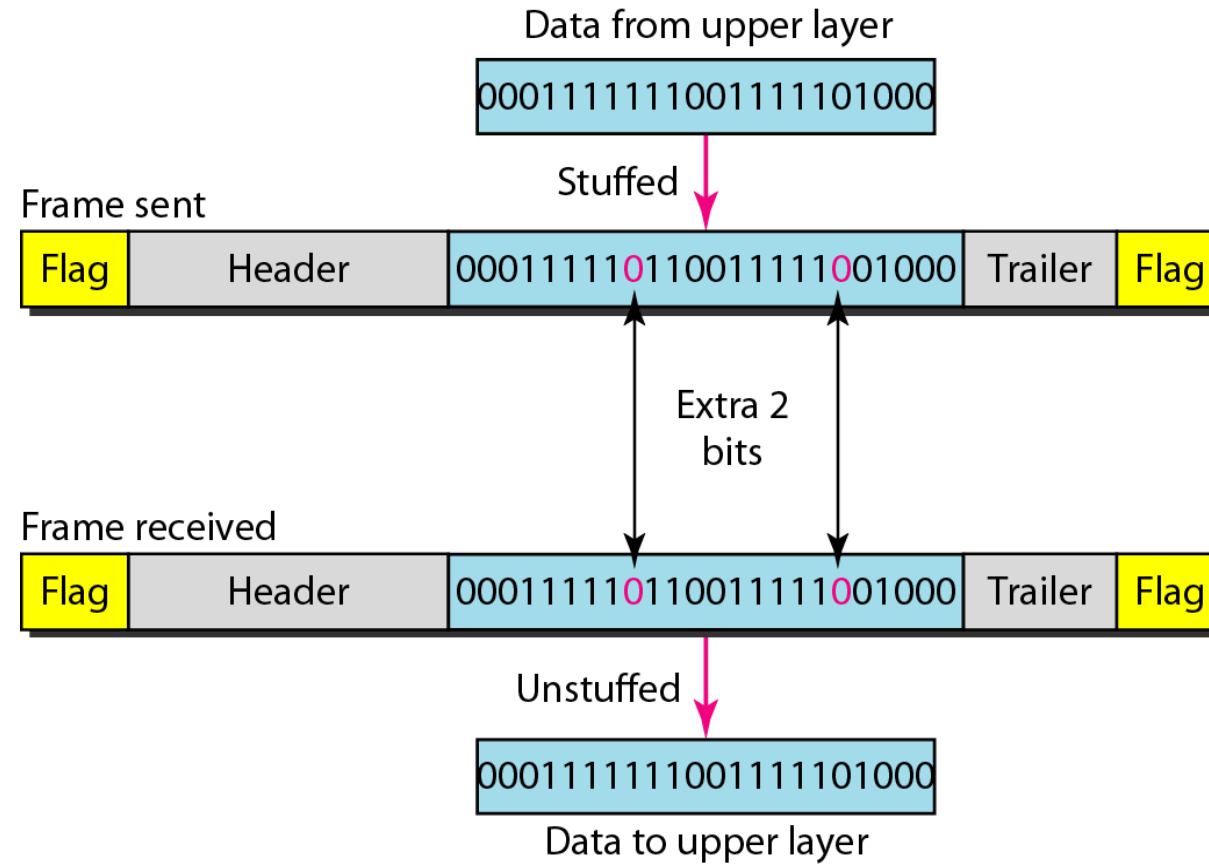- The data link layer needs to pack bits into frames, so that each frame is distinguishable from another. Our postal system practices a type of framing. The simple act of inserting a letter into an envelope separates one piece of information from another; the envelope serves as the delimiter.

Data from upper layer
Variable number of characters

| Flag | Header | | | | ... | | | Trailer | Flag |
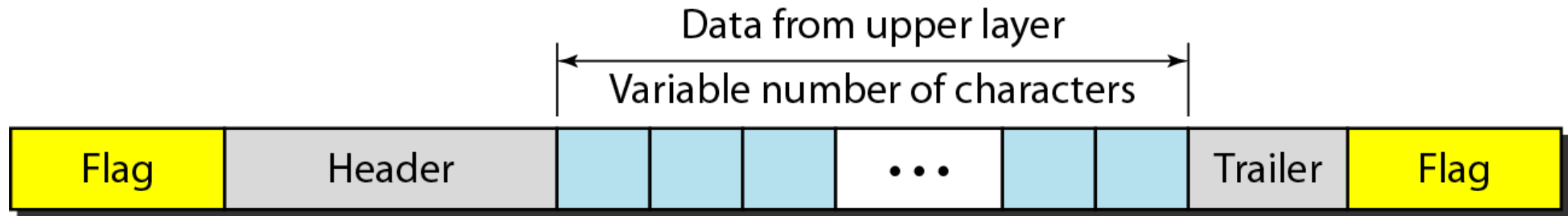
Byte stuffing and unstuffing

Bit Stuffing

Data from upper layer

`0001111111001111101000`

Stuffed

Frame sent

| Flag | Header | 0001111**1011**0011111**00**1000 | Trailer | Flag |

Extra 2 bits

Frame received

| Flag | Header | 0001111**1011**0011111**00**1000 | Trailer | Flag |

Unstuffed

`0001111111001111101000`

Data to upper layer

- A bit string, 0111101111101111110, needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing?

- Question

- One of your classmates, Scrooge, has pointed out that it is wasteful to end each frame with a flag byte and then begin the next one with a second flag byte. One flag byte could do the job as well, and a byte saved is a byte earned. Do you agree?

- Question

- The following data fragment occurs in the middle of a data stream for which the bytestuffing algorithm described in the text is used: A B ESC C ESC FLAG FLAG D. What is the output after stuffing?

- The following character encoding is used in a data link protocol:
- A: 01000111 B: 11100011 FLAG: 01111110 ESC: 11100000
- Show the bit sequence transmitted (in binary) for the four-character frame A B ESC FLAG when each of the following framing methods is used:

(1) Flag bytes with byte stuffing.

(2) Starting and ending flag bytes with bit stuffing.