

Data Link Protocols

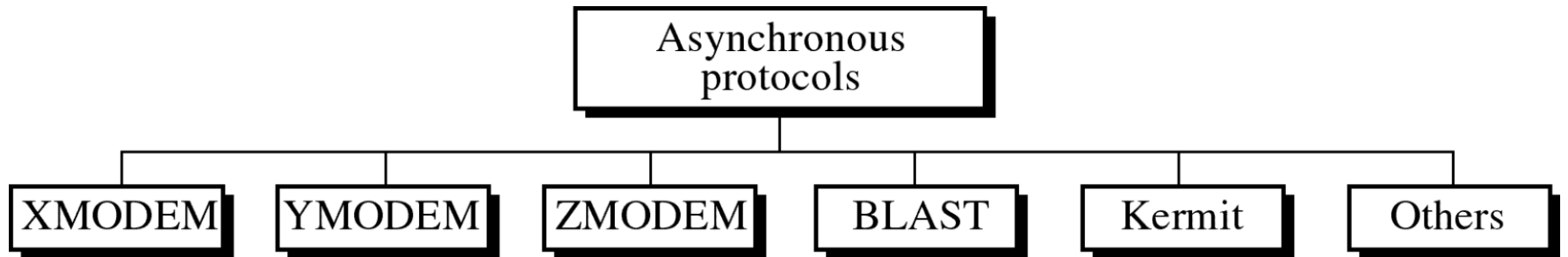
- ▶ Asynchronous Protocols
 - ▶ Synchronous Protocols
 - ▶ Character-Oriented Protocols
 - ▶ Bit-Oriented Protocols
- 

Data link
protocols

```
graph TD; A[Data link protocols] --> B[Asynchronous protocols]; A --> C[Synchronous protocols];
```

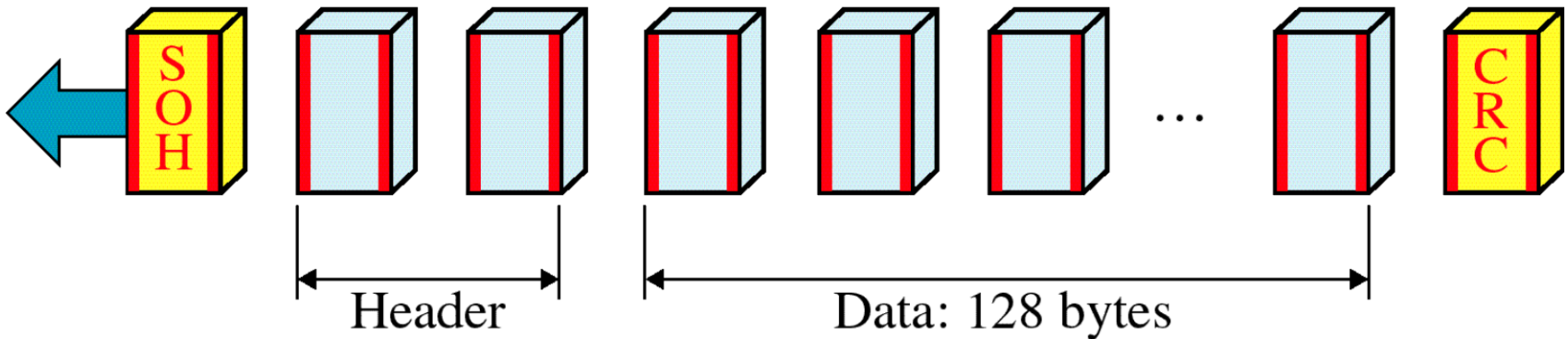
Asynchronous
protocols

Synchronous
protocols



XMODEM

Each character contains start and stop bits (dark portion of the box). Characters are separated from each other by gaps. The header consists of two bytes: sequence number and its one's complement.



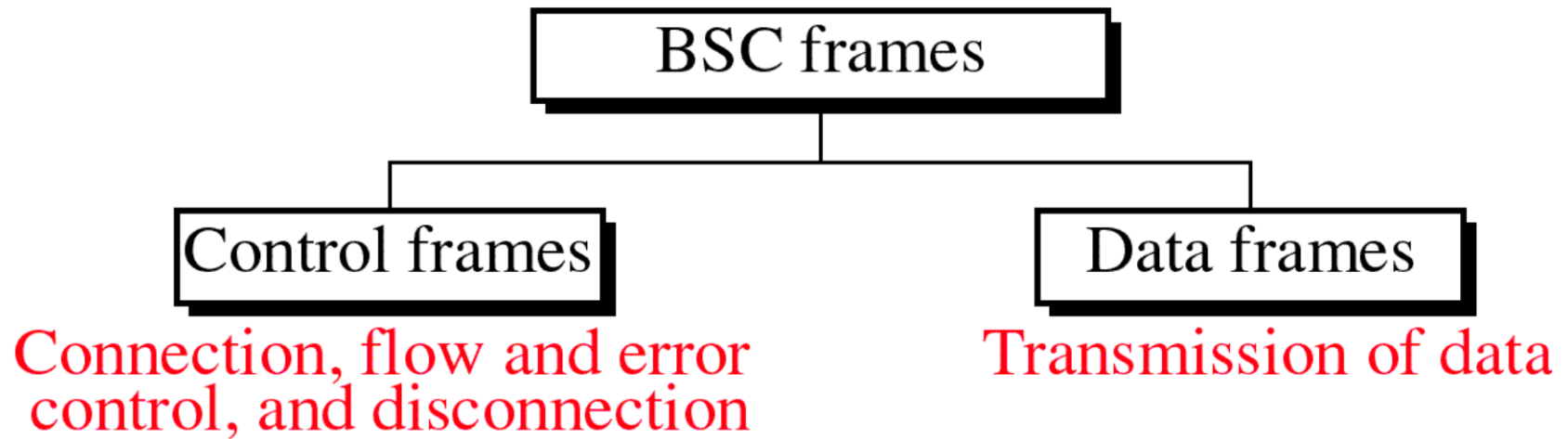
Synchronous
protocols

```
graph TD; A[Synchronous protocols] --> B[Character-oriented protocols]; A --> C[Bit-oriented protocols];
```

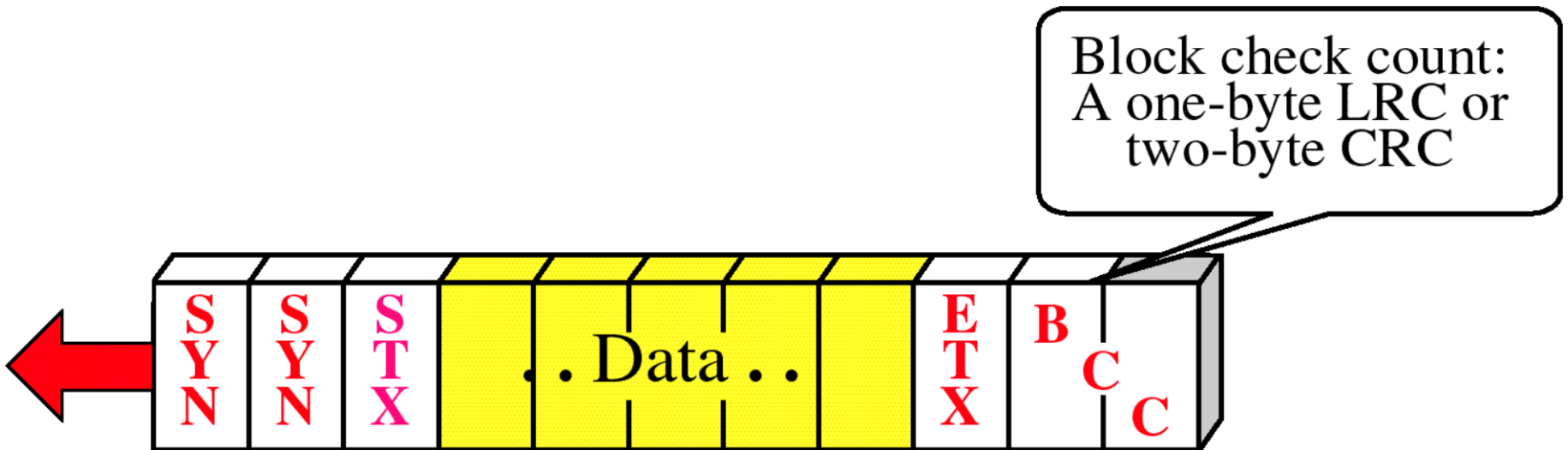
Character-oriented
protocols

Bit-oriented
protocols

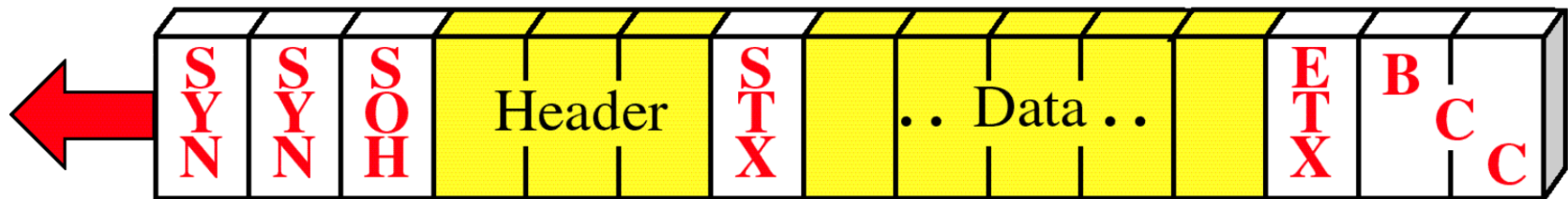
Figure 11-5



Simple Frame



A Frame with Header



Multiblock Frame

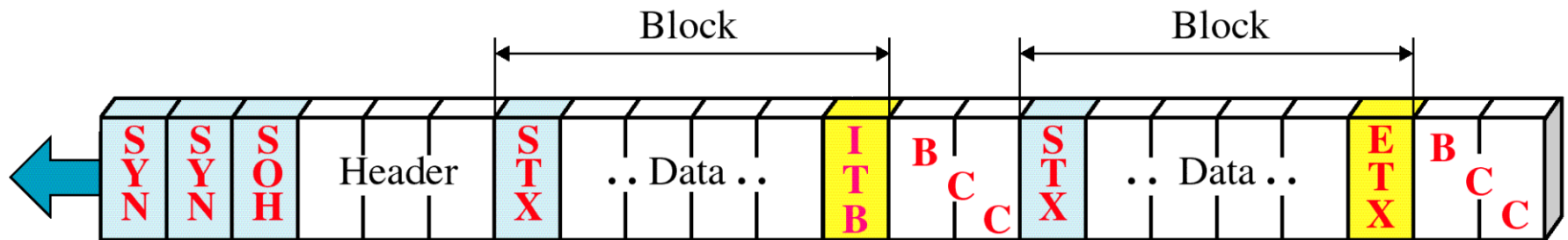


Figure 11-9

Multiframe Transmission

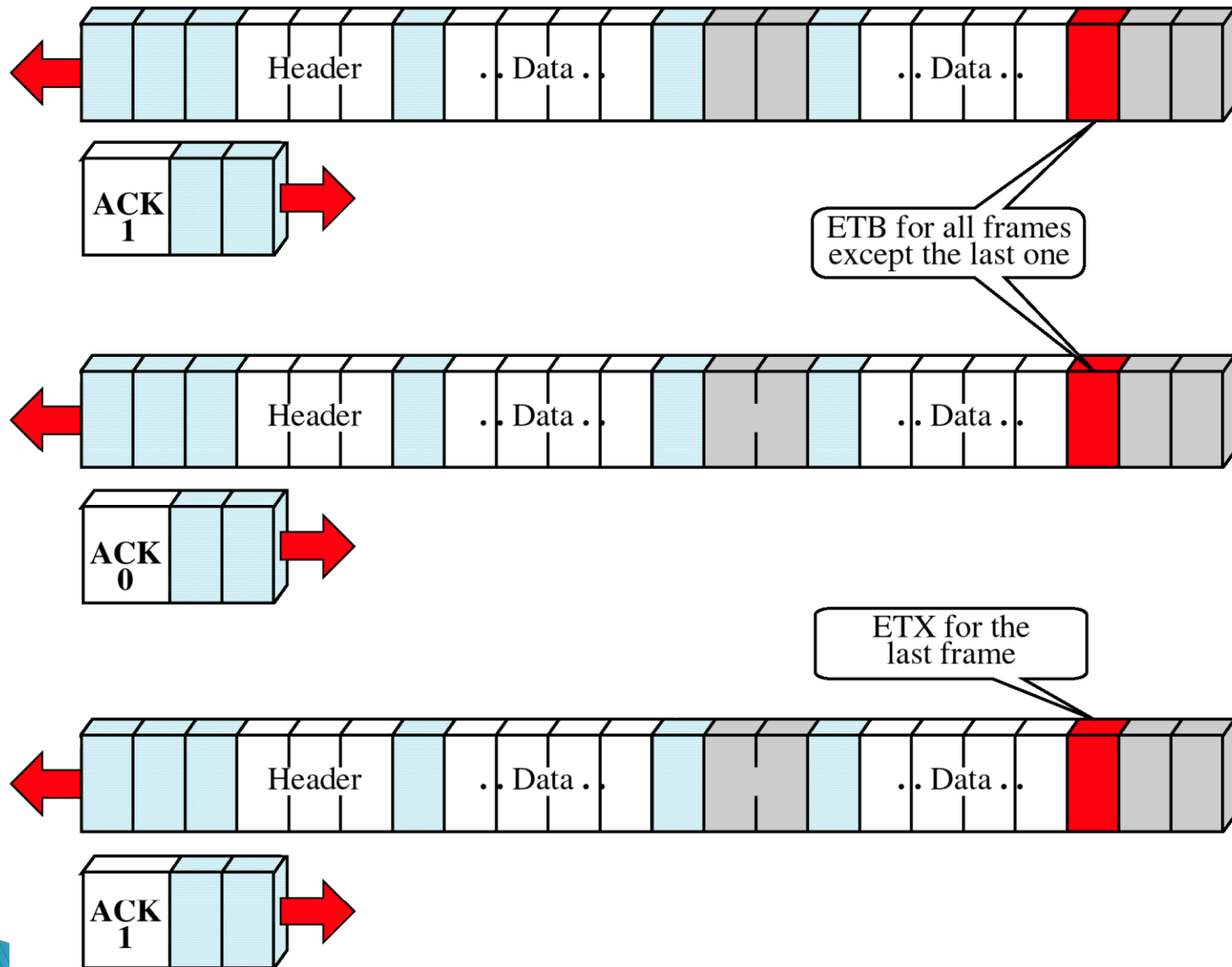
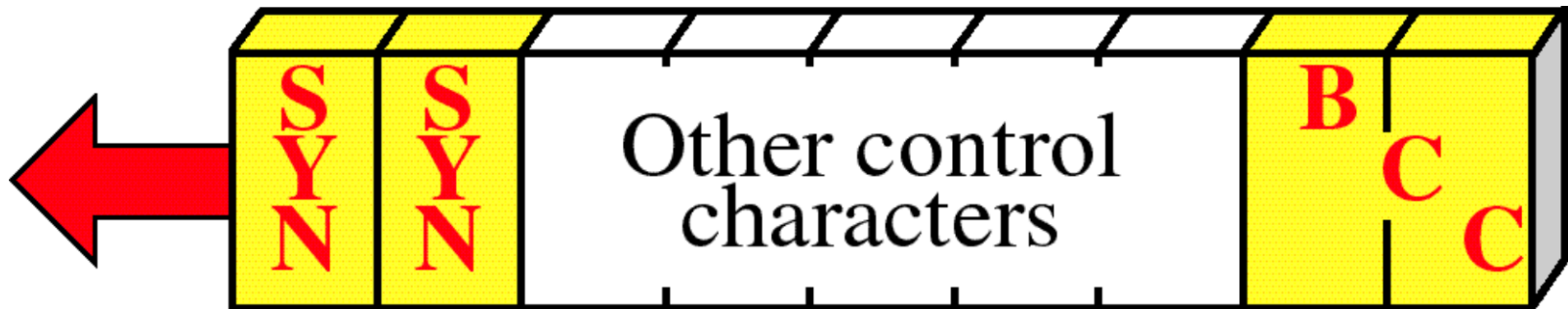


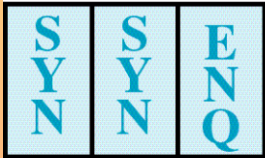
Figure 11-10

Control Frame

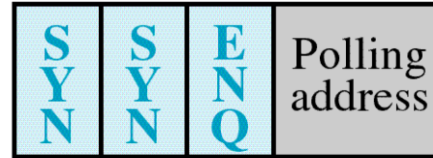


Control Frames

Connection establishment



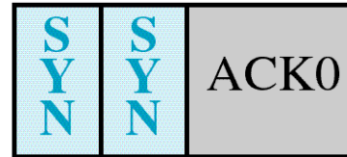
Bid
Point-to-point
connection request.



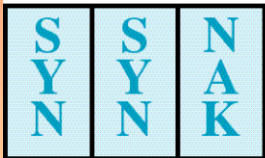
Poll
Primary polls
secondary.



Select
Primary selects
secondary.



**Positive response
to select or bid**
Ready to receive
data.



**Negative response
to select or bid**
Not ready to receive data.



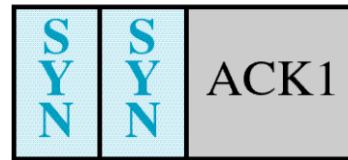
**Negative response
to poll**
Not ready to send data.

Control Frames

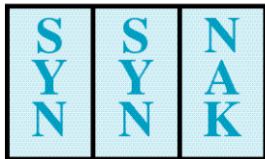
Flow and error control



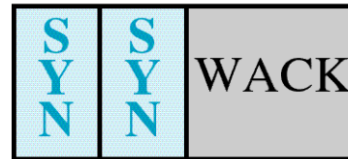
**Positive ACK
of even frames**
Frame number
0 received.



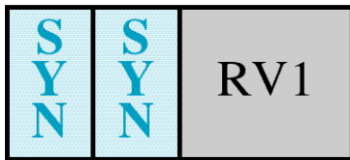
**Positive ACK
of odd frames**
Frame number
1 received.



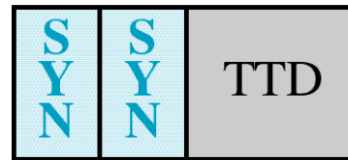
**Negative ACK
of frames**
Error in the
frame received.



Wait & ACK
ACK of previous
frame, not ready
to receive more.



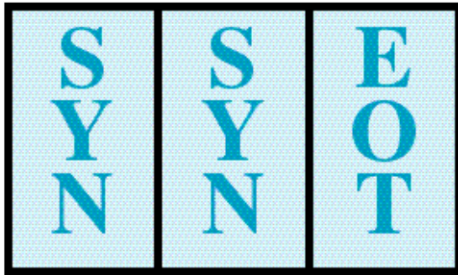
Reverse interrupt
Request for
interruption,
urgent data to send.



Temporary delay
Temporarily delayed
but does not
relinquish the line.

Control Frames

Connection termination

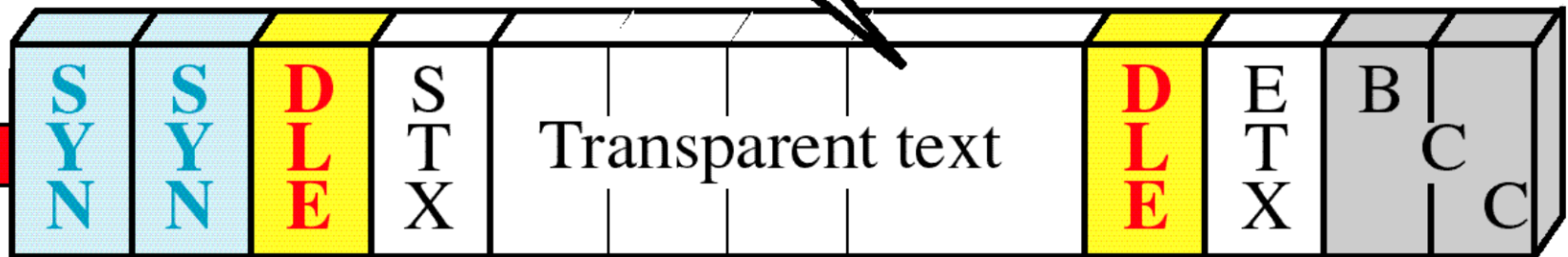


End of transmission
Station finished sending data.

Figure 11-12

Byte Stuffing

Control characters can be used as text in this region.



The DLEs start and end the transparent text.