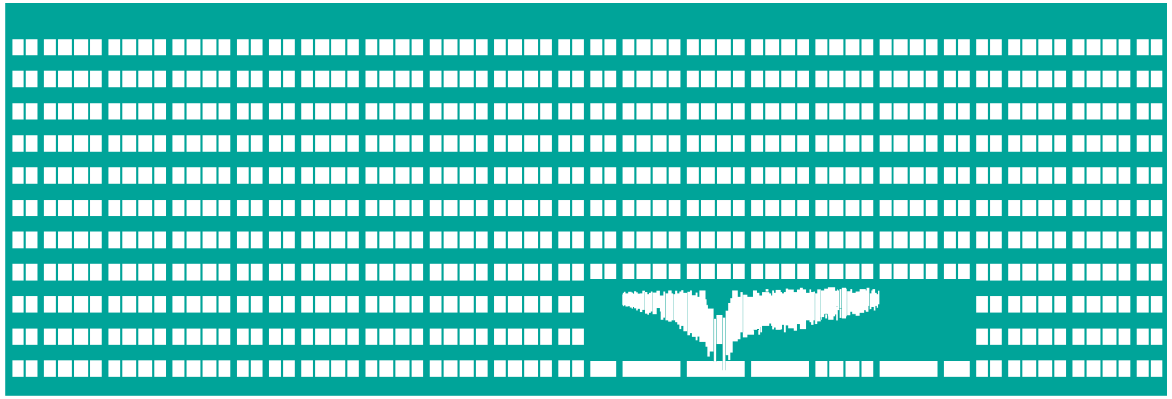
VSB TECHNICAL UNIVERSITY OF OSTRAVA | FACULTY OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE | DEPARTMENT OF COMPUTER SCIENCE

Data Link Layer Protocols



Computer Networks
Lecture 3

Data Transfer between Directly Connected Systems

- As the channel may be used to communicate between multiple stations, it is necessary to be able to a find data unit in a bit stream – a frame
- Every frame contains user data and a header with the system information
  - Transmitter and receiver addresses
  - Sequence number
  - Type of data (L3 protocol, system frame type)
- The frame may be destined either for
  - a single receiver (unicast)
  - particular group of receivers (multicast) or
  - all receivers on the channel (broadcast)

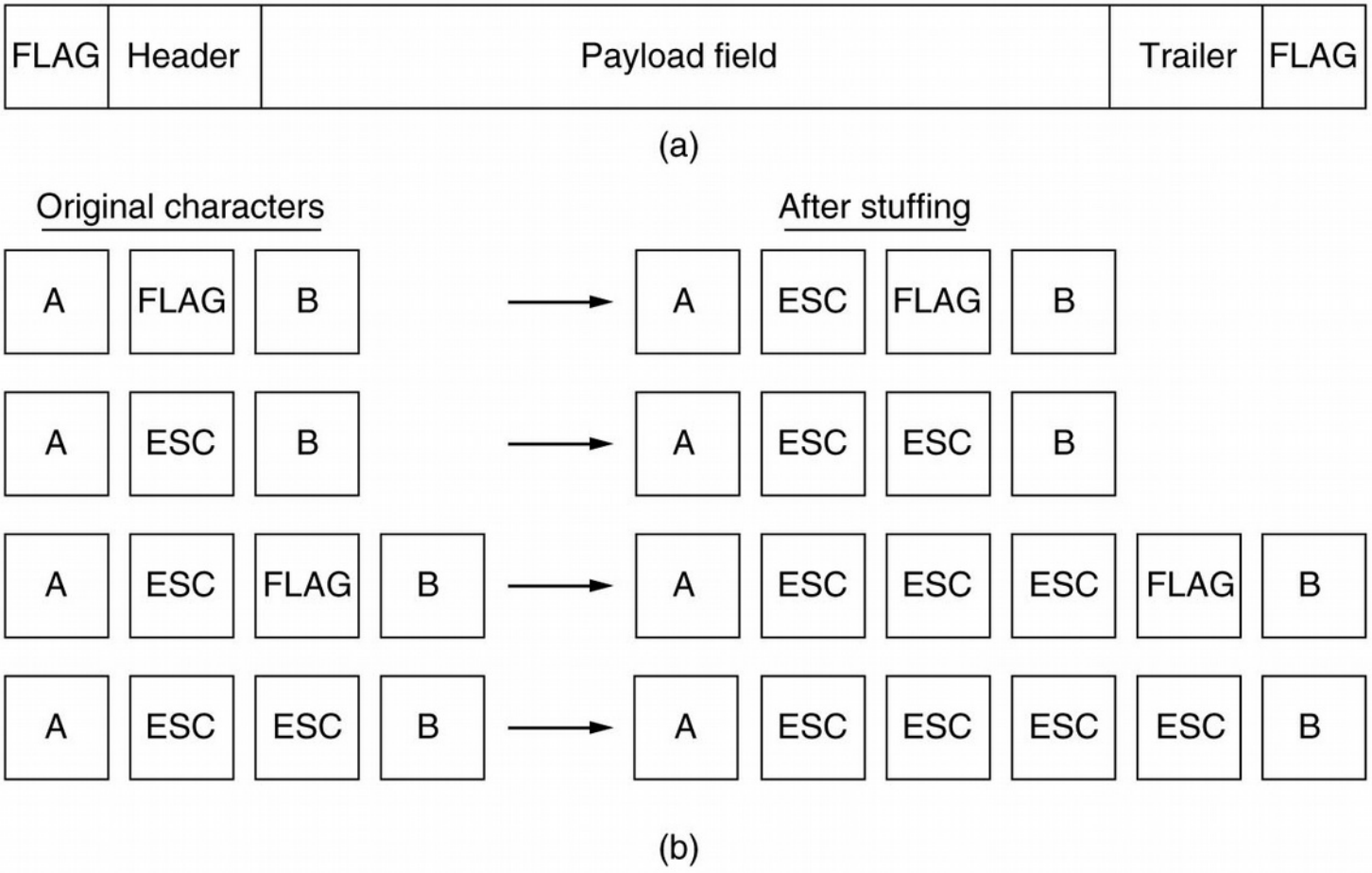
The Typical Frame Format

Character-oriented and Bit-oriented Protocols

Character-oriented (byte-oriented) Protocols

- A message is composed of character
  - characters represented by 5,6,7 or (most often) 8 bits
  - uses asynchronous serial communication
- Dependent on the utilized character set
  - ASCII, EBCDIC, ...
- Dedicated control characters may be present at any position (no fixed frame structure)
  - Start of Transmission, End of Transmission
  - Start of Frame, End of Frame
  - Start of Header, Start of User Data, …
- Typically used in industrial automation or terminal systems

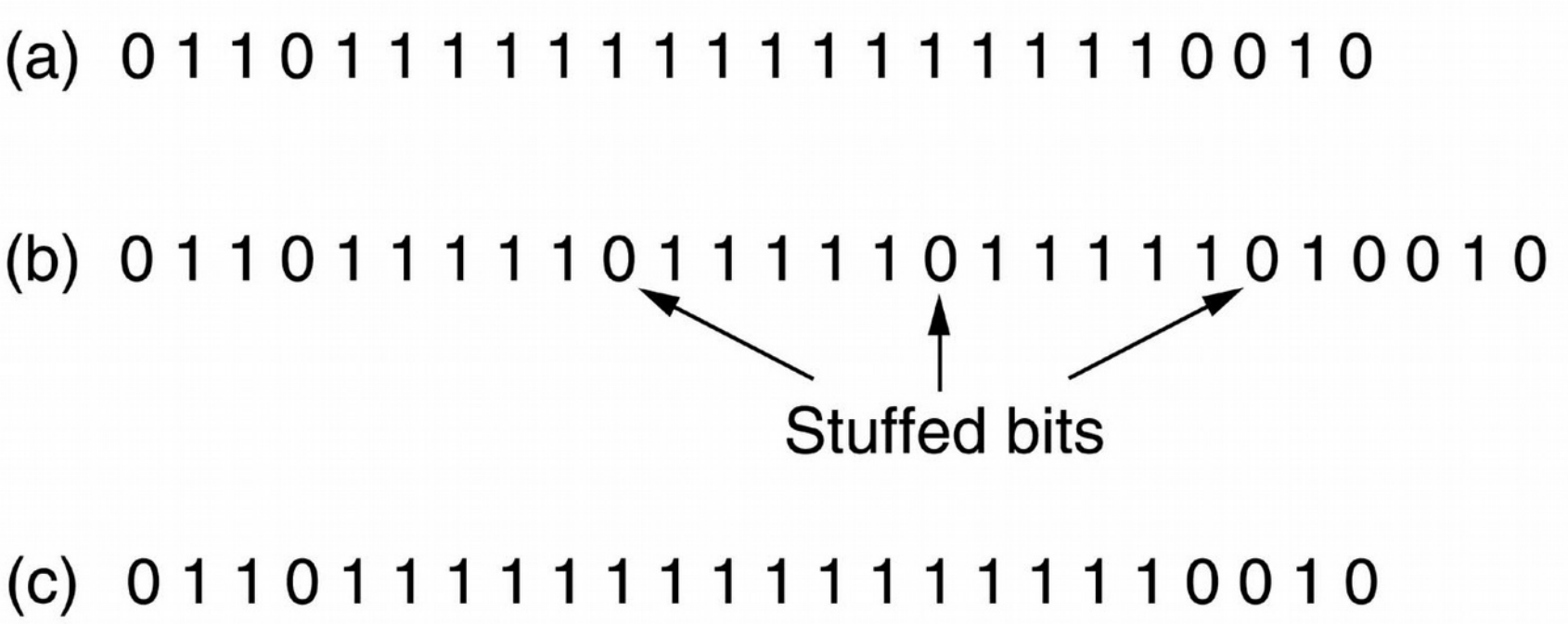
Transmission of Control Characters in User Data



Bit-oriented Protocols

- Frames of a fixed format are delimited by frame delimiters
  - Flags (typically 01111110)
    - Bit stuffing is used to transmit bit pattern corresponding to flag sequence in user data
  - Dedicated line code symbol
    - (in AMI, 4B5B, …)
- Use synchronous serial transmission
- Commonly used in LANs and WANs

Bit stuffing example



(a) Original data before transmission

(b) Zero is inserted after every 5 ones

(c) The receiver removes zero that follows 5 ones

Examples of Link Protocols

- PPP – Point to Point Protocol
  - Asynchronous or synchronous links (dial-in to ISP, links between routers, …)
- HDLC – High Level Data Link Control
  - A predecessor of the most of today's link protocols
- LAPD –Link Access Procedure – D-channel
  - Encapsulated signaling messages on ISDN D-channel
- Logical Link Control (IEEE 802.2)
  - Unifies MAC sublayers of various LANs