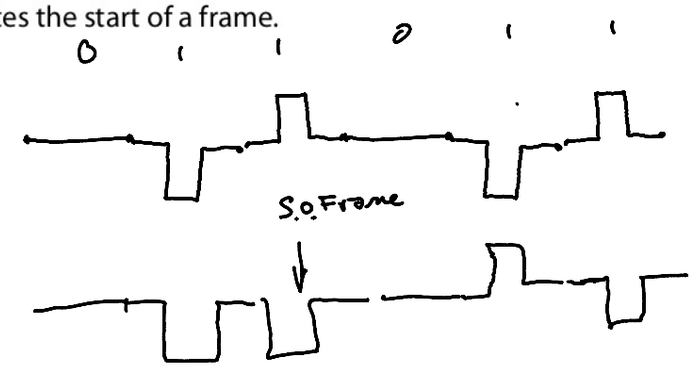
Framing

Exercise 1: Draw the waveform for an AMI-RZ encoded sequence of bits '011011' assuming the previous mark was transmitted as a positive pulse. Draw the waveform assuming the second '1' indicates the start of a frame.



Exercise 2: Preambles such as this allow multiple transmission formats to be used in a backwards-compatible way. What might be some disadvantages of using such a preamble? *Hint: to be decoded by old ("legacy") devices the preamble must be transmitted at the lowest possible data rate. This can be 100 times slower than the fastest devices.*

preamble at this rate → 11 Mb/s → 11b

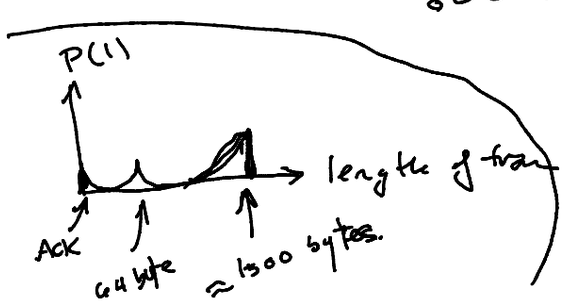
1.1 Gb/s → 11ac 100x!

preamble has 64 bits of data. = 8 bytes

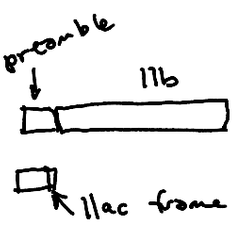
Q: how much data could we send @ 1.1 Gb/s in time it takes to send the preamble at 11 Mb/s ?

we can send 100x as much!

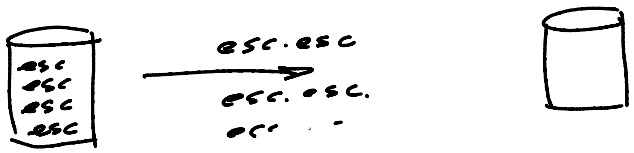
800 bytes =



→ main disadvantage of backwards compatible preambles is inefficiency at high data rates.



Exercise 3: By how much does the use of escape characters slow down a link transmitting a continuous stream of escape characters?



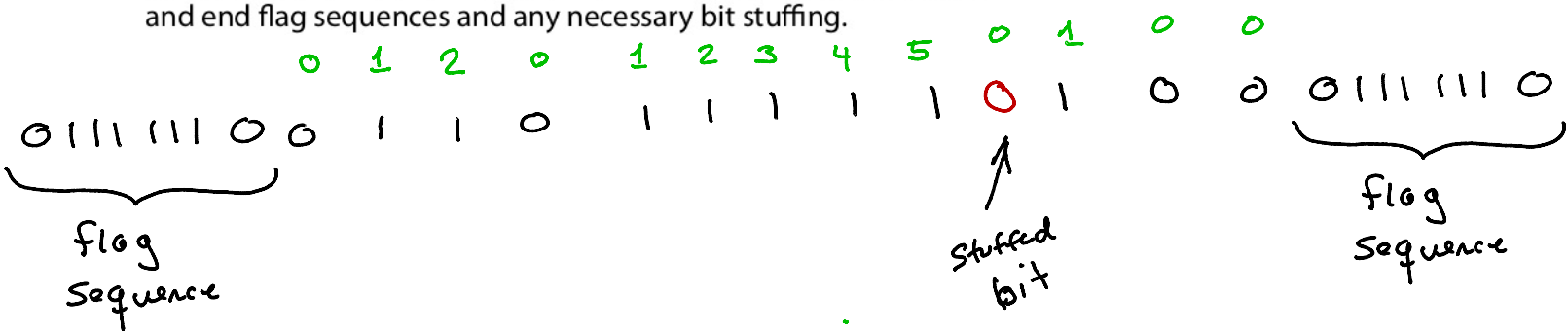
will take 2x as long.

Exercise 4: What sequence of bytes would be sent to transmit a PPP-encapsulated frame containing the bytes 0xff 0x03 0x7d 0x1b 0x7e?

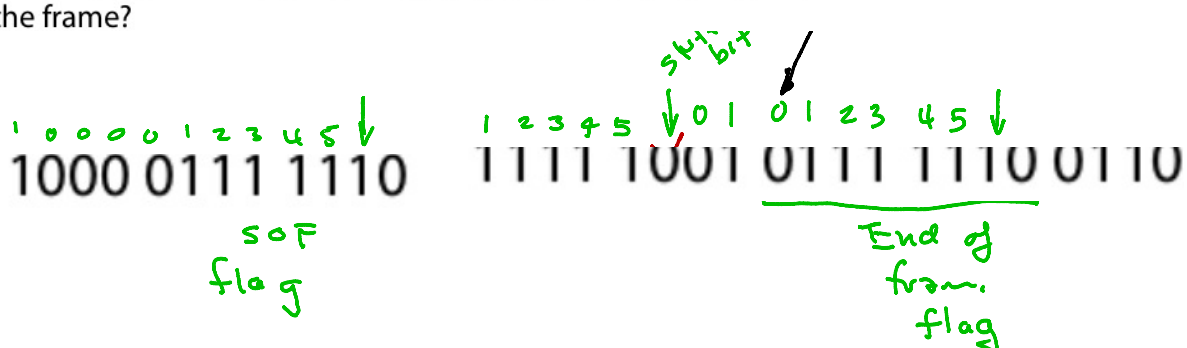
0x7e flag
0x7d escape

0x7e, 0xff, 0x03, 0x7d, 0x7d, 0x1b, 0x7d, 0x7e, 0x7e
flag — 0x7d — 0x7e — flag

Exercise 6: Write out the complete sequence of 1's and 0's required to transmit the 12 bits 0110 1111 1100. Include the start and end flag sequences and any necessary bit stuffing.



Exercise 7: An HDLC receiver sees the sequence 1000 0111 1110 1111 1001 0111 1110 0110. What data bits were contained within the frame?



data in frame: 1111101

Exercise 8: A physical layer transmits 3 bits per symbol. A frame of 128 bytes is being transmitted. How many padding bits will have to be added to the frame?

128 bytes × 8 bits/byte = 1024 bits.

∴ need $\frac{1024}{3} = 341\frac{1}{3}$ symbols.

but need to transmit 342 symbols

∴ need 342 × 3 = 1026 bits

= 1024 data bits

+ 2 padding bits

1026 bits total

receiver knows data bits are multiple of 8

$\frac{1026}{8} = 128 + \frac{1}{4}$

so extra 2 bits must be padding.

w/ 3 bits/symbol

3 bytes = 24 bits

= 8 symbols

$n \cdot 8 + 1 = m \cdot 3$