

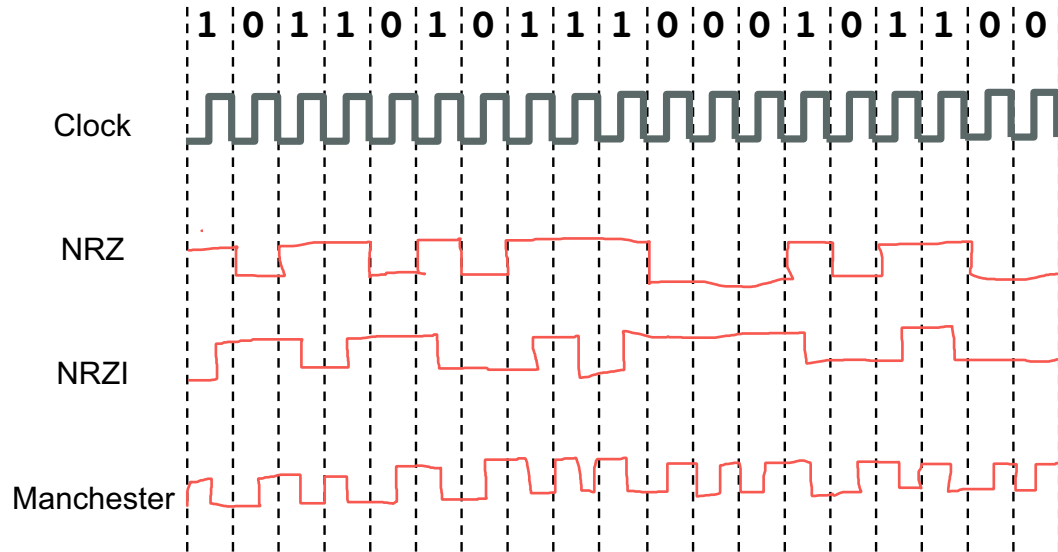
This homework is due at 11:59:59 PM on September 25, 2020 and is worth 3% of your grade.

Name: Matthew Schanzlin

CCIS Username: schanzlinm

Problem	Possible	Score
1	30	
2	20	
3	25	
Total	75	

1a. Draw in the NRZ, NRZI and Manchester encodings for the bit pattern below.



You can use Figure 2.10 of Peterson and Davie as a model.

(10 pts)

1b. Apply the bit-stuffing protocol to the pattern below and write down the resulting sequence in the boxes provided. You do not need to include any start frame/end frame sequences. .

010110111111110111111111001

0	1	0	1	1	0	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	1	0	0	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

You may not need to use all of the boxes.

(10 pts)

1c. If the bit pattern below is received at a bit-stuffing receiver, what is the interpretation of this pattern?

Sentinel

Error

01111101011110110111100001111110

This bit pattern contains 7 1s in a row. As per the slides, this means there is an error.

1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Errors right here

(10 pts)

You may not need to use all of the boxes.

- 2a. Why is it important for protocols configured on top of Ethernet to have a length field in their header indicating how long the message is? (5 pts)

The most immediate motivation to have a length field in the header is to ensure the validity of the data. For instance, if less or more data was received after the header than the amount specified in the header's length field, the receiver would know the data was corrupted/erroneous. A length field header can help with other things as well, for instance, if there is no more information to an ethernet message, the receiver could determine this by the length field being less than the maximum size of a frame.

- 2b. What kinds of problems can arise when two hosts on the same Ethernet share the same hardware address? Describe what happens and why that behavior is a problem. (10 pts)

Quite simply, a local network would have issues knowing where to send data packets if there were two of the same address. For example, if there were two devices with the same address on the same local network, packets intended for the second device could be sent to the first device since that device would have the same address. As such, the router/local network would think it sent the packets to the correct destination when in reality they went to the wrong destination.

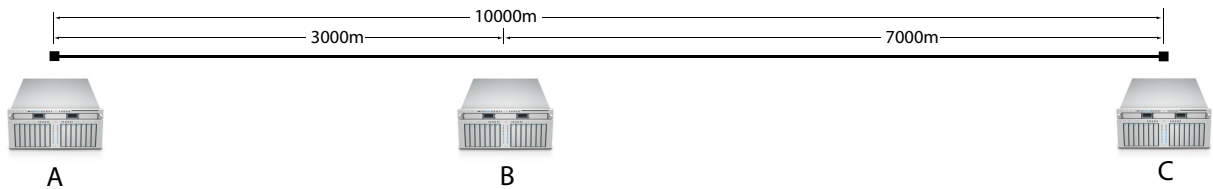
- 2c. Give **two** reasons why Ethernet sends a 64-bit preamble before every packet consisting of alternating 0s and 1s. (5 pts)

The main purpose of the preamble is to allow receivers to synchronize their respective clocks for the following ethernet data. Additionally, the preamble also functions as an "alert" to the receiver so that it can be ready for the data that follows the preamble.

- 3a. Suppose that we have an Ethernet which has a bandwidth of 5 megabits/second. If the speed of light in copper is assumed to be 2.5×10^8 meters/second, what is the minimum frame size that we must select for a LAN of length 10,000 meters? *Note that there are 1000 bits in a kilobit, 1000 kilobits in a megabit, etc.* (10 pts)

If we have to use a power of 2, then 64 bytes is the minimum frame size that gets at least 10000 meters of length. However, 50 bytes would be exactly the right frame size to get exactly 10000 meters of length.

- 3b. Suppose the layout of our LAN is as shown below.



What would happen if host A transmitted a frame that was smaller than this minimum frame size? Under what circumstances would problems occur? (10 pts)

The frame would reach host B, but it would not reach host C. Under the circumstances where packets needed to go from A to C, problems would occur since they wouldn't reach their destination.

- 3c. What is the minimum frame size that host B could send without any problems? (5 pts)

The minimum frame size host B could send without any problems is 35 bytes.