

## WH<sub>3</sub> Reference Solutions

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### Exercises and examples about the lectures

1. **What sentinel marks the end-of-frame in an Ethernet frame?** Explain your answer.

The name *Ethernet* encompasses a number of communication technologies, all of which stem from the original Ethernet. The latter, specified no end-of-frame marker, it was the receiver electronics that established the end of a frame from the extinguishing of the Manchester-encoded electrical signal. After the last bit from the frame is transmitted, the transmitter is expected to refrain from injecting any more electrical energy on the medium, thereby allowing the receiver to become aware about the frame's end.

2. **Hosts A and B are located at the edges of an Ethernet network that has a length of 2500 m.** What is the network Rtt attained when A sends a few bits to host B?

The Rtt of a shared-medium Ethernet that has the maximum length of 2500 m is 51,2  $\mu$ s.

3. **How many bits can host A (Or any other host) send in an period of time equal to the Rtt?** Recall that the transmission speed in the original Ethernet is 10 Mbps.

The transmission rate (bits/s) times the duration of time of a transmission (s) yields the number of bits that were transmitted in that time:

$$10 \text{ Mbits/s} \times 51,2 \text{ } \mu\text{s} = 10 \cdot 10^6 \text{ bits/s} \times 51,2 \text{ } \mu\text{s} \times 10^{-6} \text{ s/}\mu\text{s}$$

*Which results in 512 bits*

4. **One of the stations that comprise an HDLC point-to-point link wishes to transmit the bit-string 10111011011110101010 to the station on the other end.** Explain what the transmitter sends on the line and what the receiver's behavior is.

Let's assume that the transmitter has already sent a start of frame flag (01111110) and that a frame transmission is in progress. The sending upper-layer protocol writes the bit string 10111011011110101010 through HDLC service interface, then, since the written payload contains a sub string comprised of five bits 1, the HDLC transmitter circuit *stuffs* a bit 0 after the last bit 1 in the sub string: 101110110111100101010. The receiver suppresses the *stuffed* 0 and proceeds with the reception of the ensuing bits.

**5. Explain the transparency mechanism used in the BiSync protocol.**

BiSync's transparency mechanism is based on the insertion of a DLE character prior to sending any protocol-reserved character such as STX, DLE, etc.

**6. What sentinels are used in the HDLC protocol? What do they mark?**

The only sentinel specified in HDLC is the flag character (01111110). The frame's fields are variable-length and it's their concrete values that mark the delimitation of the remaining fields which may use length fields.

**7. What is the organization responsible for managing the allocation of 802.3 MAC addresses? What three types of MAC addresses exist? Explain the purpose of each type.**

The IEEE is the organization responsible for allocating MAC addresses. The three types of MAC addresses are: Unicast, Multicast and Broadcast.