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| Number: | 7. Assignment |
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## Exercise 1, Collision Detection and Frame Size:

Consider a 10 MBit/s CSMA/CD LAN with a bus topology of 50 m. The signal propagates with $2*10^8$ $m/s$ in the medium.

1. Calculate the upper bound of the collision detection time.

2. Calculate the minimum frame length that is required to detect a collision.

## Exercise 2, Packets and Cells:

1. Discuss the difference between packet and cell switching.

2. What are virtual switched circuits and why they are required in some scenarios?

## Exercise 3, FDDI Performance:

100 stations are connected to a large FDDI ring. The token rotation time is 40 $ms$ and the token holding time is set to 10 $ms$. Calculate the maximum efficiency of the ring.

## Exercise 4, ATM:

1. The size of an ATM cell is a compromise between the requirements of voice and data communication. Assume that ATM has cells of 1500 bytes. Calculate the time between two successive cells, if data is generated at a rate of 64 kbit/s. How large is the time for the normal ATM cell size?

2. The ATM checksum protects only the cell header. How many bit errors can be corrected with this checksum and why?

## Exercise 5, Bridge Classification:

1. Bridges can be classified as local and remote bridges. Discuss the differences.

2. What is the difference between transparent and source bridging?

## Exercise 6, IEEE 802.1d:

1. What is the task of the spanning tree protocol and how does it work?

2. What are the disadvantages of the original Spanning Tree Protocol (STP)?

3. Capture and/or create an STP packet. In which types of networks can STP be used?

## Exercise 7, Broken Links:

How can a LAN automatically resolve broken links or switches?

## Exercise 8, Virtual LANs:

1. What is the purpose of a virtual LAN?

2. What information can be used to automatically assign hosts to a particular VLAN?

## Exercise 9, IEEE 802.1q and IEEE 802.2:

1. Create, inject, and capture an Ethernet frame that contains an IEEE 802.1q header with the following values:

   - Priority = Excellent Effort
   - Canonical Format Indicator set to 1
   - VLAN ID = 0xA0
   - Type set to the value of ARP

2. Add a Logical Link Control header an 802.3 frame. Use the following values:

   - Unnumbered Frame Type
   - DSAP = Novell NetWare
   - SSAP = Xerox Network Systems
   - I/G = 0
   - C/R = 0
   - Choose any value for the command field

3. Add a SNAP header to the frame. Use the following values:

   - OUI = 0xABCD
   - Type = 0x88CE

4. What layer 3 PDU is stored as data in the frame?

5. How large is the 802.3 frame without the data?

## Exercise 10, Features of Layer 2 Protocols:

1. List features and services of layer 2 protocols.

2. Do Ethernet, IEEE 802.2, ATM, and PPP provide these features and services? Are any additional features and services provided?