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~~1 What~~

Name - Tapish katiyar
Branch - CSE
Batch - F.4
Roll No - 20/403

Exercise No 1

1. What is the smallest size of an Ethernet frame? What is the largest size of an Ethernet frame?

Ans minimum Ethernet frame size = 64 bytes (18 byte header + 46 byte playload)

maximum Ethernet frame size = 1518 bytes (18 byte header + 1500 byte playload)

2. What is the ratio of useful data to the entire frame for the smallest Ethernet frame? What is the ratio for the largest frame?

Ans => useful data for smallest Ethernet frame = 46 bytes
smallest size of Ethernet frame = 64 bytes
ratio = 46/64 = .72

=> useful data for largest Ethernet frame = 1500 bytes
largest size of Ethernet frame = 1518 bytes
ratio = 1500/1518 = 0.99

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3. One of the Ethernet standards is called 10 Base 5. It uses a bus topology and the data rate is 10 Mbps. The speed of propagation in 10 Base 5 cable is 2/3 of the speed of light. How long in meters is a bit on a 10 base 5 Ethernet?

Sol. $V_t = 10\ Mbps = 10 \times 10^6\ bps$

$V_p = \frac{2}{3} C\ m/s = 2 \times 10^8\ m/s$

data size = 1 bit

$T_t = \text{datasize}/V_t = 10^{-7}\ sec$

S (~~distance~~ length) $= V_p \times T_t$

$= V_p \times \frac{T_t}{2} = 2 \times 10^8 \times 10^{-7}\ m$

$= \frac{20\ m}{2}$ Ans

4. The maximum length of a 10 Base 5 cable is 500 meters. How long does it take for a bit to travel from the beginning to the end of the network? Ignore any propagation delay in the equipment.

Sol $V_p = 2 \times 10^8\ m/s$

$l = 500\ m$

data size = 1 bit.

$T_p = l/V_p = 5/2\ \mu sec$

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5\. Using the data in que 4, find the maximum time it takes for a sender to detect a collision. The worst case occurs when data are sent from one end of the cable and the collision happens at the other end. Remember that the signal needs to make a roundtrip

Sol

$V_p = 2 \times 10^8$ m/s

$l = 500$ m

$T_p = \frac{5}{2}$ μsec

in worst case the collision will be detect in $2T_p$ sec

$= 5$ μsec

6\. Why do you think that an Ethernet frame should have a minimum data size

Ans Because the sending station must be able to sense a potential collision before the entire frame is sent. Otherwise, in the case of collision, the frame will be discarded in the false belief that the frame has been successfully received by the destination.

7\. Using the data in que 3 and 4, find the minimum size of an Ethernet frame for collision detection to work properly.

Sol

$V_p = 2 \times 10^8$ m/s , $V_t = 10$ Mbps $= 10^7$ bps

$l = 500$ m

$T_p = 5/2$ μsec, $T_t \geq 2T_p \Rightarrow T_{t_{mini}} = 5$ μsec

minimum size of Ethernet frame $= V_t \times (T_t)_{min}$

$= 50$ bit

$= 6.25$ bytes

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8. How long time does it take to create the smallest frame in a 10 Base 5 Ethernet

Sol. smallest frame sige = 64 bytes

V_t = 10 Mbps = 10^7 bps

$T_t = \frac{64 \cdot 8}{10^7} = 512 \times 10^{-7}$ sec.

9. A 10Mbps Ethernet is sometimes said to perform well if the average offered load is no larger than 30% of the network capacity. If the load is larger, the collisions will be so frequent that too much time is spent on collisions, which in turn will result in large queuing delays in the connected computers. Now take a 100 Mbps Ethernet with the same length of the bus as in the 10 Mbps Ethernet examples and with the same offered load i.e. 30% would the proportion of lost time compared to efficient time, be larger or smaller than in the case for the 10Mbps network.

Sol given :- length of data and length is same

$(V_t)_{10}$ = 10 Mbps = 10^7 bps

$(V_t)_{100}$ = 100 Mbps = 10^8 bps

$$(t_t)_{10} = \frac{d_l}{10}$$

$$(t_t)_{100} = \frac{d_l}{100}$$

$$10\, t_{100} = t_{10}$$

In the case for 10 Mbps Network proportion of lost time compared to efficient time, be. 10 times larger from 100 Mbps

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10 Given the same scenario as in que 9. In order to show the same value regarding the proportion of lost time, how much shorter should the 100 Mbps Ethernet be compared to the 10 Mbps Ethernet?

Ans given:- $(t_t)_{10} = (t_t)_{100}$

$$\frac{(d_l)_{10}}{(V_t)_{10}} = \frac{(d_l)_{100}}{(V_t)_{100}}$$

$$\frac{(d_l)_{10}}{1\cancel{0}} = \frac{(d_l)_{100}}{10\cancel{0}}$$

the data length of 100 Mbps Ethernet should be 10 times shorter.

11. The CSMA/CD protocol is a so-called contention protocol. When does it perform best compared to controlled access protocols (like token Ring), during low loads or during high loads.

Ans CSMA/CD protocol perform best during low loads

$$\left\{ \text{Efficiency} = \frac{1}{1+6.44a} \quad (\text{where } a = T_p/T_t) \right.$$

$$\left. = \frac{1}{1+6.44\,T_p/T_t} \right\}$$

if the load is high. A station sends a packet and senses that it collides. It back off a certain time. As we have a high load, several other stations experience the same thing. They all back off. When their individual backoff times have expired, the attempt to use the medium again. There is now larger probability

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of new collision. So practically none gets to send.

12. Below is an Ethernet-II frame, ~~see lecture notes (slides)~~
The preamble, start Frame Delimiter and CRC fields have been removed in the frame below. Two degit represent one byte for eg 2E is one byte. The four left-hand side digits (including the colon) and the dashes are not parts of the frame.

08 00 20 7C 94 1C 00 00 - 39 51 90 37 08 00
45 00 00 3e 36 00 00 00 80 11 - da 4f 82 eb
12 7f 82 eb 12 0a 04 01 00 35 00 2a - ee 6a
00 01 01 00 00 01 00 00 00 00 00 00 06 67
- 65 6d 69 6e 69 03 03 6C 64 63 02 6C 75 02
73 65 00 - 00 01 00 01

Sol. formate of Ethernet-II frame

DA	SA	PDU type/size	DSAP	SSAP	Ctrl	DATA	FCS
6 byte	6 byte	2 byte	1 byte	1 byte	1 byte	>46 byte	4 byte

A) Destination add = 08 00 20 7C 94 1C
B) Source add = 00 00 39 51 90 37
c) V (PDU Type/Length) = 08 00

in decimal $8\times16^3 + 0\times16^1 + 0\times16^0 = 2048$

inf $V \geq 1536$

V = PDU Type (shows type of frame)