

Data Communication and Networking

Assignment 3 – Solution

BS/BE (CS) – CM, DM

Question 1: Suppose an IT office has a network with maximum distance equal to 60 meters. Find out maximum propagation delay of this network (Bit travelling speed = 3×10^8 m/s). Also, find vulnerable time if this network uses CSMA protocol.

Handwritten solution for Question 1:

$L = 60\text{m}; \text{ Bit Speed} = 3 \times 10^8 \text{ m/s}$

$$\text{Propagation delay} = \frac{\text{distance}}{\text{Speed}}$$

$$= \frac{60}{3 \times 10^8}$$

$$= 2 \times 10^{-7} \text{ s}$$

Vulnerable time is also same as propagation delay.
if this network uses CSMA protocol then vulnerable time is equal to propagation time.

Question 2: In a standard Ethernet with transmission rate of 20 Mbps, cable length of 3500 meters, fixed frame size of 1024 bits and bit travelling speed of 3×10^8 m/s, find out the following: -

- a) Maximum propagation delay of the network.
- b) Transmission time of a single frame on the network.
- c) Efficiency of this Ethernet.

a) Max. propagation delay of the network

$$= \frac{3500}{3 \times 10^8}$$
$$= 1.16 \times 10^{-5} \text{ s}$$

b) Transmission time of a single frame on the network.

$$= \frac{1024}{20 \times 10^6}$$
$$= 5.12 \times 10^{-5}$$

c) Efficiency of this internet.

$$\text{efficiency} = \frac{1}{1 + 6.4(a)}$$

$\therefore a = \frac{\text{propagation time}}{\text{transmission time}}$

$$a = \frac{1.16 \times 10^{-5}}{5.12 \times 10^{-5}}$$
$$a = 0.2265$$
$$\text{efficiency} = \frac{1}{1 + 6.4(0.2265)}$$
$$\text{efficiency} = 0.40 \approx 40\%$$

Question 3: Using 4-bit sequence numbers, what is the maximum size of the send and receive windows for each of the following protocols?

- a. Stop-and-Wait
- b. Go-Back- N
- c. Selective-Repeat

a) STOP-and-WAIT

$$\text{Send window} = 1$$

$$\text{Receive window} = 1$$

b) Go-Back-N

$$\text{Send window} = 2^n - 1$$

$$\text{Send window} = 2^4 - 1$$

$$\text{Send window} = 16 - 1$$

$$\text{Send window} = 15$$

$$\text{Receive window} = 1$$

c) SELECTIVE -REPEAT

$$\text{Send window} = \frac{2^n}{2}$$

$$\text{Send window} = \frac{2^4}{2}$$

$$\text{Send window} = \frac{16}{2}$$

$$\boxed{\text{Send window} = 8}$$

$$\boxed{\text{Receive window} = 8}$$