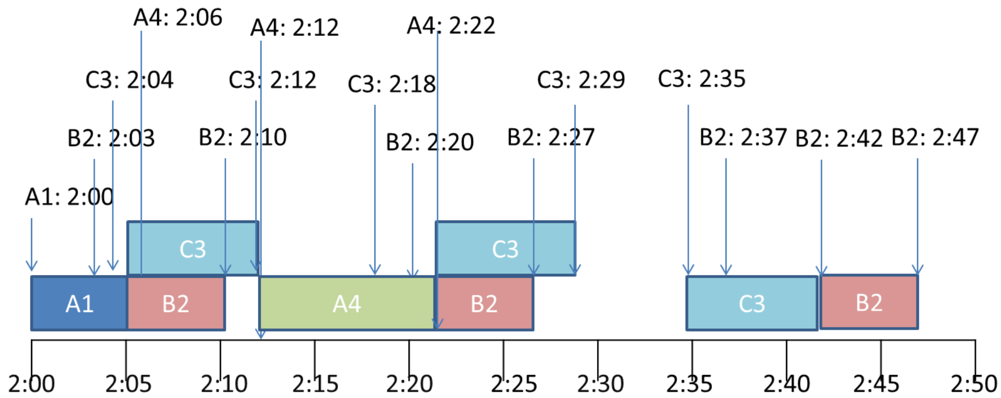
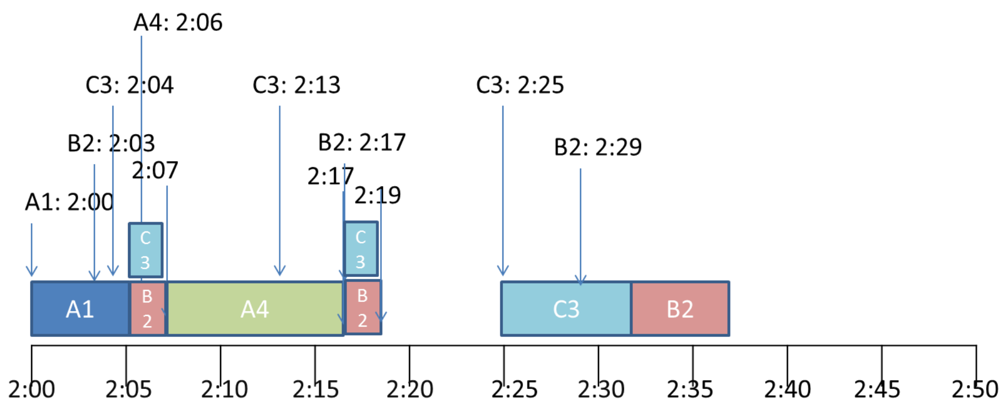
Subject :	CCN2238 : Data Communications and Networking
Lab/Tutorial :	Session 5 : MAC Protocols (Solution)

Q1. The finish time of each packet is as follows:

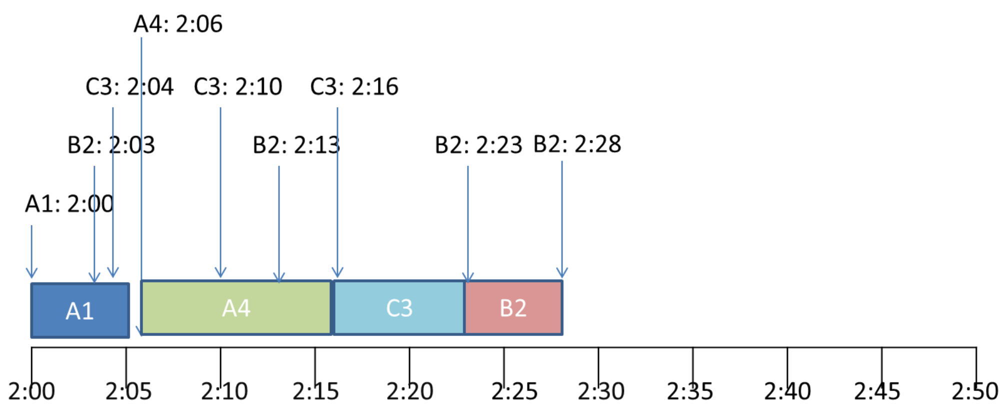
(a) (1-persistent CSMA) A1= 2:05 A4= 2:22 B2= 2:47 C3= 2:42



(b) (1-persistent CSMA/CD) A1= 2:05 A4= 2:17 B2= 2:37 C3= 2:32



(c) (Non-persistent CSMA) A1= 2:05 A4= 2:16 B2= 2:28 C3= 2:23



Q2. Let us find the relationship between the minimum frame size and the data rate. We know that

$$Tfr = (\text{frame size}) / (\text{data rate}) = 2 \times Tp = 2 \times \text{distance} / (\text{propagation speed})$$

or $(\text{frame size}) = [2 \times (\text{distance}) / (\text{propagation speed})] \times (\text{data rate})]$

or **(frame size) = K × (data rate)**

This means that minimum frame size is proportional to the data rate (K is a constant). When the data rate is increased, the frame size must be increased in a network with a fixed length to continue the proper operation of the CSMA/CD. In Example 12.5, we mentioned that the minimum frame size for a data rate of 10Mbps is 512 bits. We calculate the minimum frame size based on the above proportionality relationship

Data rate = 10 Mbps → minimum frame size = **512 bits**

Data rate = 100 Mbps → minimum frame size = **5120 bits**

Data rate = 1 Gbps → minimum frame size = **51,200 bits**

Data rate = 10 Gbps → minimum frame size = **512,000 bits**

Q3.

Given t1 = 0s and t2 = 3µs

a) t3 – t1 = Duration of A sends the first bit to C gets the first bit
= Distance / Propagation Speed = 2000 / $2x10^8$ = 10 µs
t3 = 10 µs + t1 = 10µs

b) t4 – t2 = Duration of C sends the first bit to A gets the first bit
= Distance / Propagation Speed = 2000 / $2x10^8$= 10 µs
t4 = 10 µs + t2 = 13µs

c) Duration of data transmission in A = t4 – t1 = 13 – 0 = 13 µs
No. of bits sent at A = 13µs x 10Mbps =130 bits

d) Duration of data transmission in C = t3 – t2 = 10 – 3 = 7 µs
No. of bits sent at C = 7µs x 10Mbps =70 bits

Q4. Repeat Q3 if the data rate is 100 Mbps.

Given t1 = 0s and t2 = 3µs

a) t3 – t1 = Duration of A sends the first bit to C gets the first bit
= Distance / PropagationSpeed = 2000 / $2x10^8$= 10 µs
t3 = 10 µs + t1 = 10µs

b) t4 – t2 = Duration of C sends the first bit to A gets the first bit
= Distance / PropagationSpeed = 2000 / $2x10^8$= 10 µs
t4 = 10 µs + t2 = 13µs

c) Duration of data transmission in A = t4 – t1 = 13 – 0 = 13 µs
No. of bits sent at A = 13µs x ***100***Mbps =1300 bits

d) Duration of data transmission in C = t3 – t2 = 10 – 3 = 7 µs
No. of bits sent at C = 7µs x ***100***Mbps =700 bits