Computer Networks and Distributed Systems

Questionnaire on Exponential Backoff and basic Etherswitching

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Context

- Lecture of 5/May: Exponential Backoff and Ethernet Switching
- Based on these two lecture presentations:
    - (Slides 126-128) http://paloalto.unileon.es/cn/ch2-2017.pdf
    - (Slides 1-39) http://paloalto.unileon.es/cn/ch3-part1-2016.pdf

1. An Ethernet interface has undergone four collisions when attempting transmission of a frame F, when will it attempt the next transmission attempt according to the *Exponential Backoff* algorithm?

2. Network interfaces keep a counter for the total number of collisions undergone so far, do you think that this accumulated number of collisions affects the *Exponential Backoff* algorithm?

3. Assume two Ethernet network interfaces, I_1 and I_2 that have just collided. Compose an example of the Channel Capture effect, which represents the lack of fairness in Ethernet's Exponential Backoff algorithm since, the interface that has undergone the least number of collisions in attempting the transmission of a frame F, is the most likely to win the next backoff. Compose an example that clearly illustrates Channel Capture, use small numbers for k.

4. An Ethernet interface I_1 has undergone 3 collisions with interface I_2 when attempting transmission of a frame F; I_2 has undergone 2 collisions. Compute the following probabilities:

    a. Probability that I_1 and I_2 collide again
    b. Probability that I_1 wins the backoff
    c. Probability that I_2 wins the backoff
    d. Probability that I_1 and I_2 will not collide in the next transmission attempt
    e. Assume I_1 wins the backoff and that the random number generated was 0, calculate how much time it will take until it begins transmitting F again.

5. What does the term "Store and Forward device" mean? What network equipment do you know that belong to the Store/Forward (S/F) class of equipment?

6. A network is comprised of shared medium Ethernet segments S_1-S_4, each connected to one port of a 4-port switch. Respond to the following questions:

    a. Host H in segment S_1 sends a frame which destination MAC is that of broadcast, explain which hosts will receive that frame.
    b. How many broadcast domains there exist in the network?
    c. How many collision domains there exist in the network?
7. What is a broadcast storm? Why are broadcast storms to be avoided?

8. Thoroughly review the bridge learning/switching algorithm in slide no. 9 of the 2nd presentation above, then, solve the following textbook exercises:

    a. Ch.2: 43.a and 43.b

    b. Ch3: 15, 16 and 17