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Tutorial 6 / Network Architecture

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Exercise 1

We want to calculate the application throughput of a Wi-Fi link. We assume :
— A station transmitting at 11 Mb/s.
— The data size is 1500 bytes.
— (Header + ACK) = 48 bytes.
— Synchronization data (preamble) for sending frames and ACKs with a duration of 192 μs.
— Backoff : Average of 16*20μs = 320μs (waiting for 16 time slots of 20 μs each).
— DIFS = 50μs.
— SIFS = 10μs.

Exercise 2

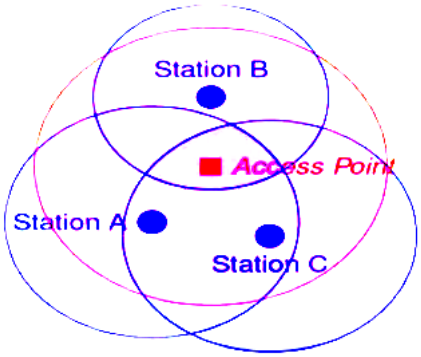

FIGURE 1 – WLAN with Infrastructure.

1. Describe a hidden terminal scenario in the network of Figure 1.
2. Describe its solution schematically, if it exists.
3. Describe the exposed terminal problem schematically in :
   (a) A WLAN with two APs
   (b) A WLAN in Ad-hoc mode

Exercise 3

1. Complete the following table :
2. Provide the center frequencies of channels 3, 10, and 12.

IEEE name	Maximum bit rate	Frequency	Channel width
802.11a			
802.11b			
802.11g			
802.11n			

Exercise 4

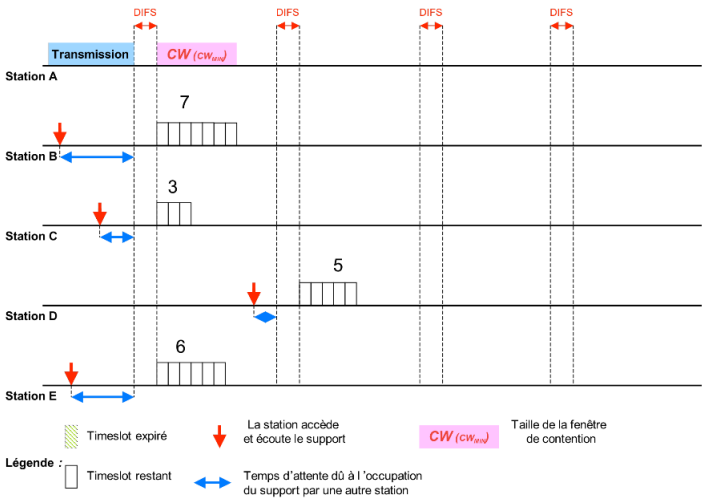

FIGURE 2 – Data exchange using CSMA/CA with Backoff

In the Figure 2 above, stations B, C, D, and E all wait after station A to transmit a frame. The waiting time in time slots is indicated.

1. Which station will start transmitting after A ? Represent the frame in the figure.
2. Indicate by shading the expired time slots at each step, and show the carry-over of time slots from one step to another. Represent the entire transmission of all stations.
3. If two stations have the same timer value, a collision will occur. These stations will then need to regenerate a new counter, which will be between 0 and x.
   (a) Provide the formula that allows you to find x.
   (b) Calculate x.