Networks Assignment (Part 2)

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1. **Sketch a topology to accurately reflect the connections of the network described above. Your topology should include all devices mentioned and their connections. As for wireless devices, you may use coverage to show connections.**

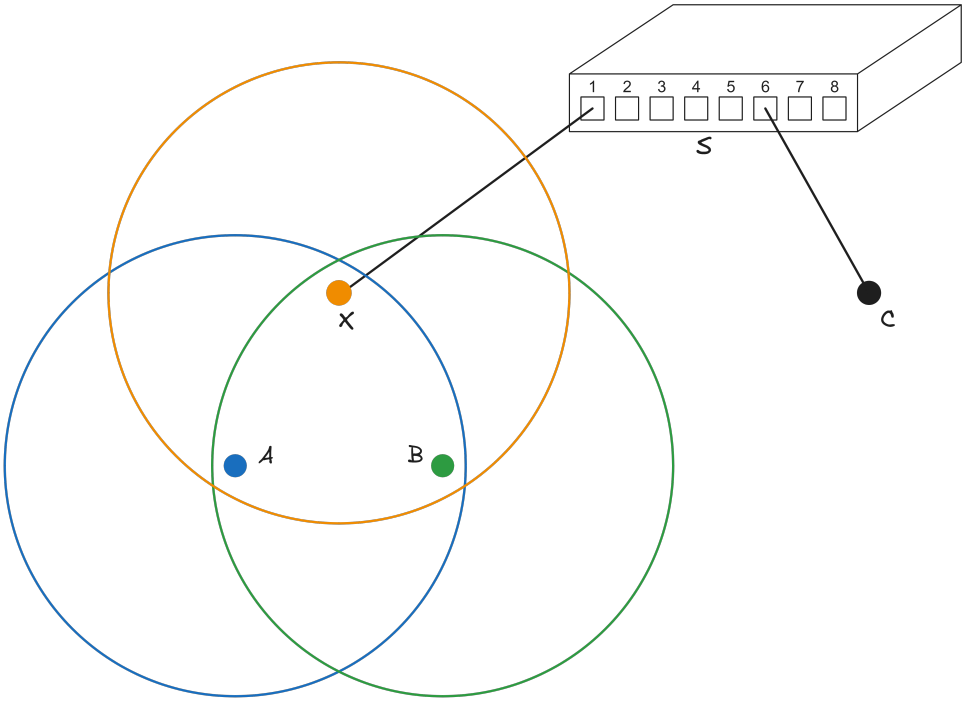

Figure 1: Topology diagram of the described network

2. **Which wireless user devices above can receive the frame sent by C? Why?**

When device C sends the frame, the frame is first received by device S (the switch) through the wired connection. Since the switch has been cold-started, it does not have any entries in its switching table and so it broadcasts the frame to every connected device excluding device C. This means it forwards the frame to device X, the Wireless Access Point (WAP). The WAP broadcasts the frame to all wireless devices within its coverage, precisely devices A and B.

Hence, **A and B** receive the frame.

3. **At what time does A start sending its frame (i.e., putting the frame on the transmission medium) to X? At what time does B start sending its frame to X? Explain.**

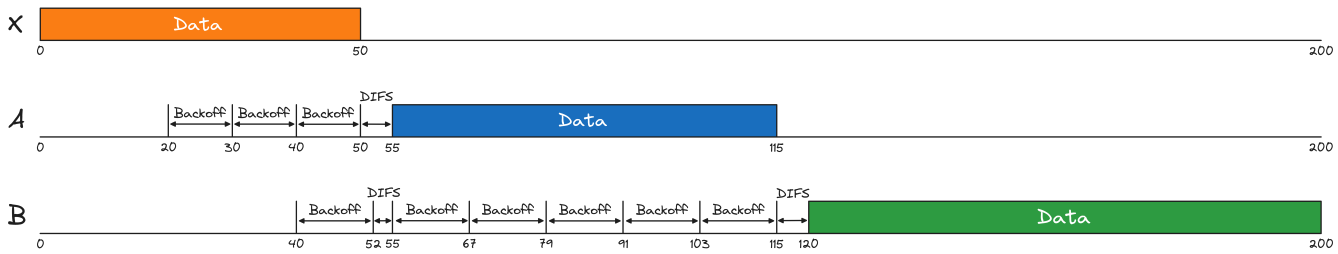

Figure 2: Communication timeline for this specific scenario

Assumption: Device X will not need to perform DIFS at t=0.

Reasoning: It says that at t=0, C is already sending the frame, so DIFS must have not been performed

At t=0μs, C begins transmitting its frame for a duration of 50μs and finishes transmitting at 50 μs.

During this time, device A attempts DIFS 3 separate times at t=20μs, 30μs, 40μs, but finds the channel busy and backs off for 10μs each time. At t=50μs, device A attempts DIFS and successfully acquires the channel, beginning the transmission of its frame at t=**55μs**.

Device B attempts DIFS at t=40μs, but senses the channel is busy and backs off for 12μs. It reattempts DIFS at t=52μs, however since device A began its DIFS at t=50μs (2μs earlier), device A is the one that acquires the channel. Device B senses this in its DIFS at t=55μs, and immediately backs off for another 12μs.

While device A is sending its frame for a duration of 60μs, device B reattempts DIFS 4 separate times at t=67μs, 79μs, 91μs, 103μs, backing off for 12μs each time. At t=115μs, device A finishes sending its frame and coincidentally, device B initiates its DIFS. It successfully acquires the channel at t=120μs and starts sending its frame. It ends its transmission at t=**200μs**.

4. **Give the switching table of S at 60 us. Explain.**

Port	MAC Address
1	AA-AA-AA-AA-AA-AA
2	
3	
4	
5	
6	CC-CC-CC-CC-CC-CC
7	
8	

Assumption: The WAP only forwards the packets, it does not modify or wrap the packets. i.e. it doesn't modify the source address of each frame.

Assumption: The switch stores the source MAC Address in the switching table immediately after the frame first reaches the switch.

Initially, since the switch is cold started, its switching table contains no entries.

At t=0μs, device C begins transmitting their frame to some device connected to the WAP. The switch takes note of the source MAC address (CC-CC-CC-CC-CC-CC) and port (6) from which this frame came from. The switch cannot unicast this frame since its switching table doesn't contain any devices connected to the WAP, hence, it broadcasts this frame to all devices except device C. It does this by sending the frame to all the ports except port 6.

At t=55μs, device A begins transmitting their frame to device C. The frame is first sent wirelessly to the WAP and the WAP forwards this frame to the switch across its wired connection. The switch takes note of the frame's source MAC address (AA-AA-AA-AA-AA-AA) and the port (1) from which it came from. The port is 1 because the frame arrived indirectly from device A through the WAP and the WAP is connected to port 1. Since device C is already in the switching table, the switch can unicast the frame directly to device C by sending to port 6.

The switching table remains unchanged until t=120μs.

5. **If you connect a computer to port 2 of S, which frame(s)can you receive from all the above processes? Explain.**

If you connect a computer to port 2 of S, it will only receive the first frame (sent by device C).

This is because the switch is cold-started, hence initially its switching table is empty. This means that when C is transmitting its frame, the switch has to broadcast the frame to all connected ports (in this case ports 1 & 2).

After this first transmission, device C's MAC address and connected port are stored in the switching table. This means for all subsequent transmissions (A ⟶ C and B ⟶ C), the switch can directly unicast the frames to C, therefore the computer connected to port 2 won't receive these frames.