Networks Sub-module Assignment

Answers for Part 2

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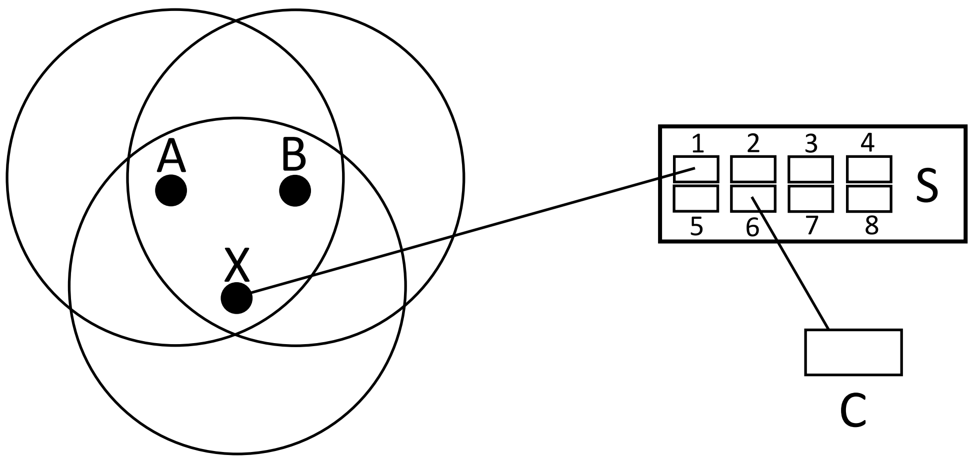
lmhw33

1. Sketch a topology to accurately reflect the connections of the network described above. Your topology should include all devices mentioned and their connections.



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

Wireless user devices **A** and **B** can both receive the frame sent by **C**. This is because the frame can be sent via the switch (**S**) to wireless access point **X**. From there it can be sent to both user devices **A** and **B**, as they can both hear **X**. The communications between **A**, **B**, and **X** adopt the CSMA/CA scheme. This means that when receiving the frame from **X**, there will not be any collisions (where **A** or **B** is trying to send a frame and would therefore not be able to receive one), and the frame will be received without issue.

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.

All transmissions from **A** and **B** pass through **X** and **S** on their way to **C**, as do transmissions from **C** to **A** or **B**. As there is only one channel for frames to pass form **X** to **C**, and communications between **A**, **B**, and **X** adopt the CSMA/CA scheme, only one frame can be transmitted at a time from **C** to **X**, **B** to **C**, or **A** to **C**.

The frame for the transmission from **A** to **C** becomes available at time 20µs. At this point the channel is busy, meaning **B** cannot begin sending the frame. As the backoff timer for **A** is 10µs, the channel is sensed every 10µs, until time 50µs, when **C** has completed sending the initial frame and the channel is sensed idle. The channel must be sensed idle for the Distributed Inter-Frame Space (DIFS), which is 5µs, before a new transmission to **C** can commence. This means that <u>**A** can begin sending the frame to **X** at 55µs</u>.

The frame for the transmission from **B** to **C** becomes available at time 40µs. At this point the channel is busy, meaning the frame cannot begin sending. As the backoff timer for **B** is 12µs, the channel is sensed again at time 52µs. Now the channel is idle, and **B** waits for the DIFS to elapse before it begins sending the frame. However, **A** begins transmitting a frame at 55µs, meaning the channel is busy again before the DIFS has elapsed (which would have been at 57µs). **B**'s backoff timer is restarted at 55µs and then repeatedly until **A** has completed transmission to **C**.

A completes the transmission of the frame to **C** at time 115µs (55µs + 60µs = 115µs). **B** senses the channel as idle again at 115µs, after 5 backoff timers have elapsed (55µs + (5 × 12µs) = 115µs). The channel must be sensed idle for the DIFS, after which <u>**B** can begin sending the frame to **X** at 120µs</u>.

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

As the switch and all the devices are all cold started, the switching table is initially empty. At 0µs the switch receives a frame from **C**. This contains the source MAC address (**C**'s MAC Address) and a destination MAC address (**X**'s MAC address). This allows the switch to match **C**'s MAC address with the port through which the frame came (port 6) and store this information in the switching table. As there is no acknowledgement whether a frame is received, **X** does not send a frame back through the switch, and its MAC address and port number are not stored in the switching table.

At 55µs the switch receives a frame from **X**, through port 1, which has come from **A**. The frame has **A**'s MAC address as the source MAC address, and **C**'s MAC address as the destination MAC address. Hence, **A**'s MAC address will be added to the switching table with the corresponding port (port 1). The frame will then be unicast to **C**, as its MAC address has a corresponding port in the switching table.

No other frames are sent through **S** in the described network before 60µs. Hence, the switching table for **S** at time 60µs would appear as follows:

MAC Address	Port
CC-CC-CC-CC-CC-CC	6
AA-AA-AA-AA-AA-AA	1

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**, you can receive the initial frame sent from **C** to **X**, as when this passes through the switch, the switching table is empty. This means the switch does not know which port **X** is connected by and will broadcast the frame through every port. However, as your computer's MAC address will not match the destination's, it won't be able to process the frame.

The next two frames are sent from **A→X→C** and **B→X→C**. In both cases, the frames will be sent through **S** on their way from **X** to **C**, with the destination MAC address of **C**. When the switch receives the frame, it will search the switching table for the port associated with **C**'s MAC address, and find it is port 6. The frame will be unicast through port 6 and not broadcast, meaning the computer connected at port 2 will not receive the frame.