Answers for Session 3c - Carrier Sense and Medium Access

1. Seems that the DCF works properly in the same AP. BTW, in a wireless network, there are a lot of APs accessing the same media. How does it work with a variety of APs?

Distributed Coordination Function (DCF) is a mandatory medium access control (MAC) protocol used in IEEE 802.11-based Wireless Local Area Networks (WLANs), including Wi-Fi. It is responsible for coordinating access to the shared wireless medium and preventing collisions between data transmissions from different stations.

DCF uses a Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) mechanism to achieve collision avoidance.
This means that before transmitting any data, a station listens to the wireless medium to see if it is busy
(Busy in the sense, It can detect a frame from the same AP/ Different AP/ non 802.11 frame or any noise on the same channel).
If the medium is busy, the station waits for a random amount of time before trying to transmit again.
If the medium is clear, the station transmits its data
This random backoff time helps to reduce the likelihood of collisions occurring.

(DCF operates on RF level, senses the medium, decides to back off/ transmit the data.DCF works well even with variety of AP's when surrounded)

2. Does the contention window and NAV work in a similar way?

Yes, the contention window and NAV work in a similar way, but they have different purposes.

Smaller the contention window, smaller the wait time. It works by requiring each device to wait for a random amount of time before transmitting. This helps to spread out the transmissions and reduces the chance of two devices transmitting at the same time.

The NAV also helps to avoid collisions and extra effort to keep listening to the channel.NAV also helps us to prevent hidden terminal problems. It works by allowing a transmitting device to set the

NAV on all other devices in the vicinity. This tells the other devices that the channel is busy and that they should wait until the NAV expires before transmitting.

Example:

Suppose that device A and device B are both trying to transmit packets at the same time. Lets us say Device A has a lesser contention window compared to Device B.

Device A will listen to the channel for 10 milliseconds before transmitting. If the channel is clear, device A will transmit its packet. If the channel is busy, device A will wait another 10 milliseconds before trying again.

Device B will listen to the channel for 20 milliseconds before transmitting. If the channel is clear, device B will transmit its packet. If the channel is busy, device B will wait another 20 milliseconds before trying again.

If device A and device B both start listening to the channel at the same time, device A is more likely to transmit first because it has a shorter contention window.

3.How legacy clients will decode higher standards preamble detection? how will they wait during transmission between AP and 802.11ax STA?

Legacy clients cannot understand the higher standard preamble, this is the reason why a legacy preamble is added to the frame. So that the legacy devices can detect the legacy preamble and back off.

4.In retransmission, if CW reaches the highest exponential slot, then what will happen , client ll start again from retransmiitio-1 or ll continue with last exponential slot until success ?
(retries happen for how long? Any limit?)

If the contention window (CW) reaches the highest exponential slot in retransmission, the client will continue with the last exponential slot until success.

The CW is used by the client to determine how long to wait before retransmitting a packet. The CW is initially set to a minimum value, and it is doubled after each unsuccessful retransmission. The maximum value of the CW is reached after a certain number of retransmissions

If the CW reaches the maximum value, and the client is still unable to successfully transmit the packet, the client will continue to retransmit the packet using the maximum CW value until success.

This is to prevent the client from retransmitting the packet too often, which could lead to network congestion.

Here is an example:

1. A client sends a packet to an AP.
2. The packet is not received by the AP.
3. The client retransmits the packet.
4. The packet is still not received by the AP.
5. The client doubles the CW and retransmits the packet again.
6. This process continues until the CW reaches the maximum value.
7. The client continues to retransmit the packet using the maximum CW value until it is successfully received by the AP.

It is important to note that the client will not start over from retransmission-1 if the CW reaches the highest exponential slot. This is because the client has already tried to retransmit the packet multiple times, and it is unlikely that the packet will be successfully transmitted if the clients start over

Also, Generally There will be a retry limit, generally 10, If the retry count reaches 10 the frame will be dropped.