Jonathan Woong
804205763
CS 118 – DIS 1A

Homework 8

1. Remember that Carrier Sensim Multiple Access (CSMA) protocols has several modes of operation:

- 1-persistent: `10Base2 Ethernet, the likelihood of packets being lost is quite low, so the frame transmission probability is 1 when sensing an idle channel.`
- non-persistent:
- p-persistent: `802.11 WiFi, the likelihood of packets being lost is quite high compared to Ethernet, so a frame transmission probability of p is necessary to account for other possible wireless stations transmitting frames.`

`ALOHA and Slotted ALOHA do not belong.`

Which of the sensing modes are used in the shared bus 10Base2 Ethernet, 802.11 WiFi, ALOHA, and Slotted ALOHA. For each, describe the rationale for the choice.

2. 802.11 MAC Protocol (Section 6.3.2 in 6th edition) uses CSMA/CA protocol with the following four steps when there is a frame to transmit:

a. If initially the station senses the channel idle, it transmits its frame after a short period of time known as the Distributed Inter-frame Space (DIFS);

b. Otherwise, the station chooses a random backoff value using binary exponential back-off and counts down this value when the channel is sensed idle. While the channel is sensed busy, the counter value remains frozen.

c. When the counter reaches zero (note that this can only occur while the channel is sensed idle), the station transmits the entire frame and then waits for an acknowledgment.

d. If an acknowledgment is received, the transmitting station knows that its frame has been correctly received at the destination station. If the station has another frame to send, it begins the CSMA/CA protocol at step 2. If the acknowledgment isn't received, the transmitting station reenters the back-off phase in step 2, with the random value chosen from a larger interval.

Note that in step 4, when a station has more data to send it moves to the step 2, rather than to step 1. What rationale might the designers of CSMA/CA have had in mind by having such a station not transmit the second frame immediately (if the channel is sense idle)?

`The idea behind designing CSMA/CA this way is to ensure that each station has a fair chance of transmitting frames. If a station moves to step 1 instead of step 2, it will cause other stations that want to transmit frames to go into a backoff state. This means that one station gets to send all of its frames while others wait, which is not fair to other stations. By moving to step 2, stations give other stations a chance at transmitting frames.`

Jonathan Woong
804205763
CS 118 – DIS 1A

Homework 8

3. Please answer the following question about 802.11 WiFi:

a. Why are acknowledgments used in 802.11 WiFi but not in wired Ethernet?

Acknowledgements are used in WiFi because the chance of losing a packet is greater than with wired Ethernet. Acknowledgements allow for more steady throughput when the chance of dropping packets is increased compared to Ethernet.

b. Is it true that before an 802.11 station transmits a data frame, it must first send an RTS frame and receive a corresponding CTS frame. Why?

False.

c. Highlight differences between 802.11 Wifi and Ethernet frame.

1. 802.11 frame has duration field, while Ethernet frame does not.
2. 802.11 frame has three MAC address fields, Ethernet frame has two Ethernet address fields.
3. 802.11 frame has ad hoc field, Ethernet frame does not.
4. Ethernet frame has preamble, 802.11 frame does not.
5. Ethernet has collision detection, 802.11 does not.
6. 802.11 sends acknowledgement, Ethernet does not.

d. List roles an Access Point plays in infrastructure mode 802.11 WiFi?

1. Control access to network (as switch)
2. Communicate with RADIUS server (if you have one)
3. Communicate with wireless host (as basestation)

4. Consider the following network topology with specified MAC addresses for network interfaces and the configured IP addresses:

Assuming that the network is already set up and communication is ongoing (wireless node is associated with the AP and ARP caches have all necessary IP-MAC mappings, the embedded switch in the AP has correct switch table):

a. Show frame or frames to send a packet from Node B to Node A

Ethernet frame (Node B to access point):

Preamble	Destination MAC	Source MAC	Type	Dest IP	TCP	DATA	CRC
	00:00:00:00:00:04	00:00:00:00:00:02		192.168.0.2			

Jonathan Woong
804205763
CS 118 – DIS 1A

Homework 8

802.11 frame (access point to Node A):

Frame Control	Duration	Destination MAC	Access Point Address	Source MAC	Sequence Control	Address 4	Payload	CRC
		00:00:00:00:00:01	00:00:00:00:00:04	00:00:00:00:00:02				

b. Show frame or frames to send a packet from Node A to the Router

802.11 frame (Node A to access point):

Frame Control	Duration	AP MAC	Source MAC	Destination MAC	Sequence Control	Address 4	Payload	CR
		00:00:00:00:00:04	00:00:00:00:00:01	00:00:00:00:00:03				

Ethernet frame (access point to router):

Preamble	Destination MAC	Source MAC	Type	Dest IP	TCP	DATA	CRC
	00:00:00:00:00:03	00:00:00:00:00:01		192.168.0.1			

c. Show frame or frames to send a packet from the Router to Node B

Ethernet frame (router to access point):

Preamble	Destination MAC	Source MAC	Type	Dest IP	TCP	DATA	CRC
	00:00:00:00:00:04	00:00:00:00:00:03		192.168.0.3			

Ethernet frame (access point to Bode B):

Preamble	Destination MAC	Source MAC	Type	Dest IP	TCP	DATA	CRC
	00:00:00:00:00:02	00:00:00:00:00:03		192.168.0.3			

5. In mobile IP, what effect will mobility have on end-to-end delays of datagrams between the source and destination?

Mobility will usually increase the delay of datagrams between source to mobile compared to direct routing. This is because datagrams must be sent to a home agent and then to the mobile. However, the delay can vary depending on whether the datagram is routed through the home agent or not.