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Course Number: EE450
Homework 3

Assignment 3

Chapter 6

Problem 18

If A transmits a minimum-size frame, that is, 512 + 64 = 576 bits, A needs 576 / 10 * 10^6 = 0.0000576 seconds to finish transmitting. In the worst case, B starts transmitting just right before the first bit of A reaching B. Because the time for the first bit of A reaching B is 325 / 10 * 10^6 = 0.0000325 seconds, at the seconds of 0.0000324 is the worst case for B to start transmitting. Therefore, at seconds of 0.0000324, B detects collision and transmits a jamming signal. Due to the propagation delay is the same as the first bit of A, that is, 0.0000325 seconds, the first bit of B's jamming signal reaching A is 0.0000324 + 0.0000325 = 0.0000649 seconds, which is larger than 0.0000576 seconds that A needs to finish transmitting the minimum-frame. Hence, A can finish transmitting before it detects that B has transmitted, and A incorrectly believes that its frame is successfully transmitted without a collision.

Problem 19

At t = 245 bit times, both A and B detect collision and start transmitting a jam signal. Because the length of a jam signal is 48 bits, at t = 245 + Tp + Tt = 245 + 245 + 48 = 538 bit times, both A and B finish receiving the whole jam signal, and then A detects the channel is idle. After that, A must wait for a IFS time, that is, 96 bit times before transmitting, so at t = 538 + 96 = 634 bit times, A starts transmitting. At t = 634 + Tp = 634 + 245 = 879 bit times, the first bit of A's retransmission reaches B. After t = 245 + 48 = 293 bit times, B finishes transmitting a jam signal, and it needs to wait Kb * 512 = 1 * 512 bit times of backoff time and 96 bit times of IFS time. Therefore, at t = 293 + 512 + 96 = 901 bit times, B schedules its retransmission. Because of 879 < 901, B refrains from transmitting at its scheduled time.

Problem 22

I assign MAC address and IP address to clients needed as follow:

Clients	**MAC/IP**
A	AA-AA-AA-AA-AA-AA/192.168.1.101
Router(interface for A)	BB-BB-BB-BB-BB-BB/192.168.1.1
Router(interface for F)	CC-CC-CC-CC-CC-CC/192.168.3.1
F	DD-DD-DD-DD-DD-DD/192.168.3.101

(i)
Source MAC address: AA-AA-AA-AA-AA-AA
Destination MAC address: BB-BB-BB-BB-BB-BB

Source IP address: 192.168.1.101
Destination IP address: 192.168.3.101
(ii)
Source MAC address: AA-AA-AA-AA-AA-AA
Destination MAC address: BB-BB-BB-BB-BB-BB
Source IP address: 192.168.1.101
Destination IP address: 192.168.3.101
(iii)
Source MAC address: CC-CC-CC-CC-CC-CC
Destination MAC address: DD-DD-DD-DD-DD-DD
Source IP address: 192.168.1.101
Destination IP address: 192.168.3.101

Problem 23

The maximum aggregate throughput is (9 + 2) * 100 = 1100 Mbps, because each client has its own collision domain due to the switch it connects to and no one shares its link.

Problem 24

There are three departments, and each hub only allows one collision domain, which means the maximum throughput for each hub is 100 Mbps. However, two servers still keep the same: they have their own collision domain, and each collision domain's maximum throughput is 100 Mbps. Thus, the maximum aggregate throughput is 300 + 100 + 100 = 500 Mbps.

Problem 25

All clients, 11 hosts and 2 servers, share a collision domain, so the maximum aggregate throughput is 100 Mbps.

Problem 26

Event	**Switch Table**	**Links**
Before (i)	empty	
B sends a frame to E		Flood the frame to all links except the one with B
After (i)	1. Know B MAC address	
Before (ii)	1. Know B MAC address	
E replies with a frame to B		Forward the frame to B link
After (ii)	1. Know B MAC address	

	2. Know E MAC address	
Before (iii)	1. Know B MAC address 2. Know E MAC address	
A sends a frame to B		Forward the frame to B link
After (iii)	1. Know B MAC address 2. Know E MAC address 3. Know A MAC address	
Before (iv)	1. Know B MAC address 2. Know E MAC address 3. Know A MAC address	
B replies with a frame to A		Forward the frame to A link
After (iv)	1. Know B MAC address 2. Know E MAC address 3. Know A MAC address	

(i) Because the switch doesn't know which port is for E, so it floods the frame to all links.
(ii) Because the switch knows which port is for B, so it only forwards the frame to B link.
(iii) Because the switch knows which port is for B, so it only forwards the frame to B link.
(iv) Because the switch knows which port is for A, so it only forwards the frame to A link.

Chapter 7

Problem 5

a. Two stations, each associated with a different AP, are in the same channel. It means two stations share the media and bandwidth. For the shared media, two stations will receive each other's frame, but they will not process the received frame, because the MAC address is not specifically addressed to them. For the shared bandwidth, the data rate of two stations will be affected. Plus, it is possible a collision will occur. Thus, CSMA/CA or RTS/CTS takes into place.
b. If two stations, both associated with different AP, are in different channels, there will not be shared media, shared bandwidth, and collision. Two stations can transmit as they want if there is no other station.