Assignment #1

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Part One

1. Since we know the address is 193.1.1.0 which is class C then the subnet mask 255.255.255.0 is applied. This means we can modify the last octet in the mask to modify the network which gives us 256 possible addresses. By taking 2 bits of the last octet we can apply a 193.1.1.0/26 mask (255.255.255.192) to get 4 separate networks (.0, .64, .128, .192).

	Router	Device 1	Device 2
Network 1	193.1.1.0	193.1.1.1	193.1.1.2
Network 2	193.1.1.64	193.1.1.65	193.1.1.66
Network 3	193.1.1.128	193.1.1.129	193.1.1.130
Network 4	193.1.1.192	193.1.1.193	193.1.1.194

2. In each of these questions the mask is applied to the first n-bits of the ip address to determine the subnet. Once the subnet is determined we can look up the address in the routing table to determine which device to route the packet to next.

   (a) Taking the first 22 bits of 135.46.63.10 you get 135.46.60.0. Thus this matches Interface 1 which is where the packet will be forwarded to.

   (b) Taking the first 22 bits of 135.46.57.14 you get 135.45.56.0. Thus this matches Interface 0 which is where the packet will be forwarded to.

   (c) Taking the first 23 bits of 135.46.52.2 you get 135.45.52.0. This does not match any of the subnets in the routing table thus the packet will be forwarded to the default gateway which in this case is Router 2.

   (d) Taking the first 23 bits of 192.53.40.7 you get 192.53.40.0. Thus this matches Router 1 which is where the packet will be forwarded to.

   (e) Taking the first 23 bits of 192.53.56.7 you get 192.53.56.0. This does not match any of the subnets in the routing table thus the packet will be forwarded to the default gateway which in this case is Router 2

3. Dijkstra's Algorithm - Each iteration the values in the table are updated if there is a shorter path found to the node which already exists in the cloud.

Iter	B	C	D	E	F	G	H
1	2	∞	∞	∞	∞	6	∞
2	2	9	∞	4	∞	6	10
3	2	9	∞	4	6	5	10
4	2	9	10	4	6	5	8

4. a) The window size is constantly increased by 1, until the maximum size is hit. In this case we need to transmit 2000 packets of 1KB with the max window size of 500KB. To transmit the packets the window will increase by 1, until all 2000 packets are sent $(1 + 2 + 3 + ... + n = 2000)$ or $\frac{n(n+1)}{2} = 2000$

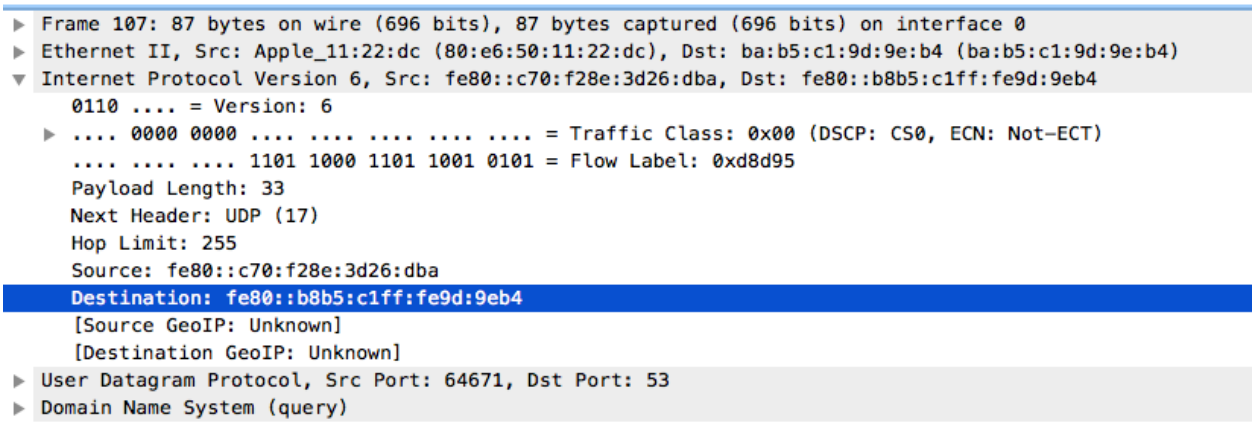
   Solving for only the positive side of n (since it is a quadratic function) we get 63. Thus the congestion window size of 500KB is never reached so no decrease occurs. Therefore the total time is $63 \cdot 3.3 = 207$ which is 207 ms.

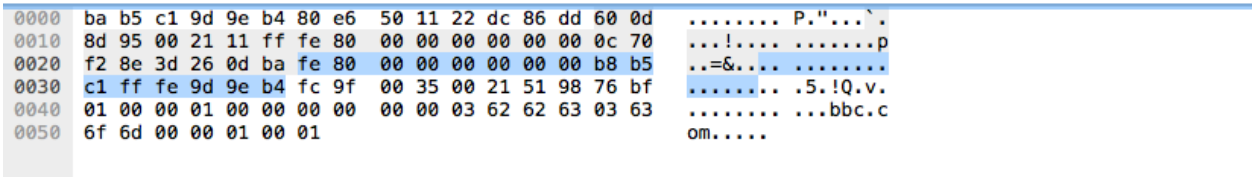
   b) The window size, starting at 1KB, is doubled, until the maximum size is hit. To fit all 2000 packets we will need to make 11 trips, which is less than the 500KB maximum window size: $1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 + 256 + 512 + 1024 = 2047$

   Thus the total time is $11 \cdot 3.3 = 36.3$ which is 36.3ms.

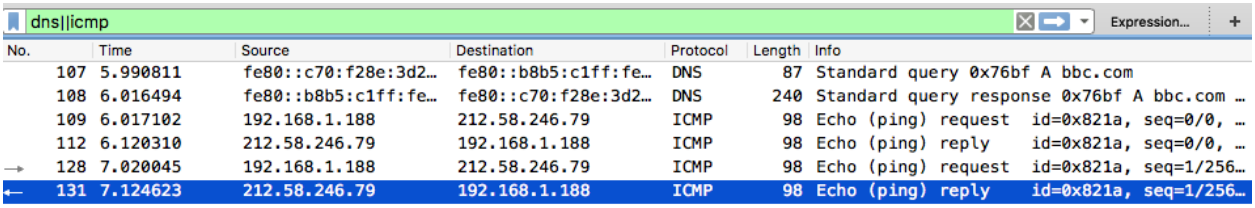
Part Two

1) The IP address was found in the IPV6 frame which come right after the ethernet 2 header and before the UDP datagram. The destination address was `fe80::b8b5:c1ff:fe9d:9eb4`. The destination address can be seen in the following image:





2) The two types of messages being exchanged are ICMP request (Echo ping request) and ICMP response (Echo ping response). The ping request is sending a request to the server with a TTL of 64. The server then responds with a TTL of 49. Therefore the server is reachable after 15 hops. The messages being exchanged can be seen in the image below:



3) The IP address of bbc.com is `212.58.246.79` as seen in the ping request. Refer to the image in Q4 the line "destination" is where the ping request is being routed to.

4) The IP address of my personal computer is `192.168.1.188` as seen in the ping request. Refer to the image... the line "source" is where the ping request is being sent from (my computer).