California State University, Monterey Bay

Week 8 - Homework 11
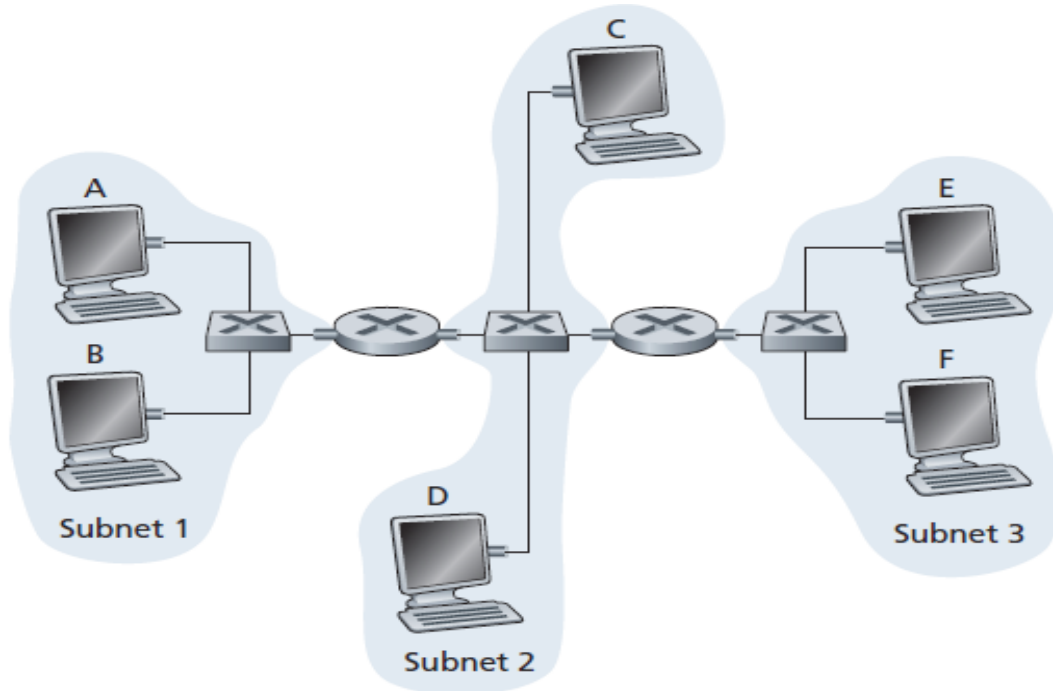
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CST311

Introduction to Computer Networks

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Problem

This problem is taken from 'Computer Networking: A Top-Down Approach', 6/E by Kurose and Ross.

1. Consider sending an IP datagram from Host E to Host F. Will Host E ask router R1 to help forward the datagram? Why? In the Ethernet frame containing the IP datagram, what are the source and destination IP and MAC addresses?

   No. Host E will check the subnet prefix the IP address of Host F. It will then know that F is in the same LAN

   The following is the Ethernet frame from Host E to Host F:

Source IP	Host E's IP address
Destination IP	Host F's IP address
Source MAC	Host E's MAC address
Destination MAC	Host F's MAC address

2. Suppose E would like to send an IP datagram to B, and assume that E's ARP cache does not contain B's MAC address. Will E perform an ARP query to find B's MAC address? Why? In the Ethernet frame (containing the IP datagram destined to B) that is delivered to router R1, what are the source and destination IP and MAC addresses?

No, because host E can know that they are not on the same LAN by checking B's IP address

The following is the Ethernet frame from E to R1:

Source IP	Host E's IP address
Destination IP	Host B's IP address
Source MAC	Host E's MAC address
Destination MAC	The MAC address of R1's interface connecting to Subnet 3.

3. Suppose Host A would like to send an IP datagram to Host B, and neither A's ARP cache contains B's MAC address nor does B's ARP cache contain A's MAC address. Further suppose that the switch S1's forwarding table contains entries for Host B and router R1 only. Thus, A will broadcast an ARP request message. What actions will switch S1 perform once it receives the ARP request message? Will router R1 also receive this ARP request message? If so, will R1 forward the message to Subnet 3? Once Host B receives this ARP request message, it will send back to Host A an ARP response message. But will it send an ARP query message to ask for A's MAC address? Why? What will switch S1 do once it receives an ARP response message from Host B?

Since the destination address is a broadcast address, Switch S1 will broadcast the Ethernet frame via both its interfaces when the received ARP frame. It also learns that A resides on Subnet 1, which is connected to S1 at the interface connecting to Subnet 1. Additionally, Switch S1 will update its forwarding table to include an entry for Host A.

Yes, router R1 also receives this ARP request message, but R1 won't forward the message to Subnet 3. Host B won't send ARP query message to ask for Host A's MAC address. Because Host B can know it from A's query message. Once switch S1 receives Host B's response message, it will add an entry for Host B into its forwarding table, and then drop the received frame as destination Host A is on the same interface as host B (i.e., A and B are on the same LAN segment).