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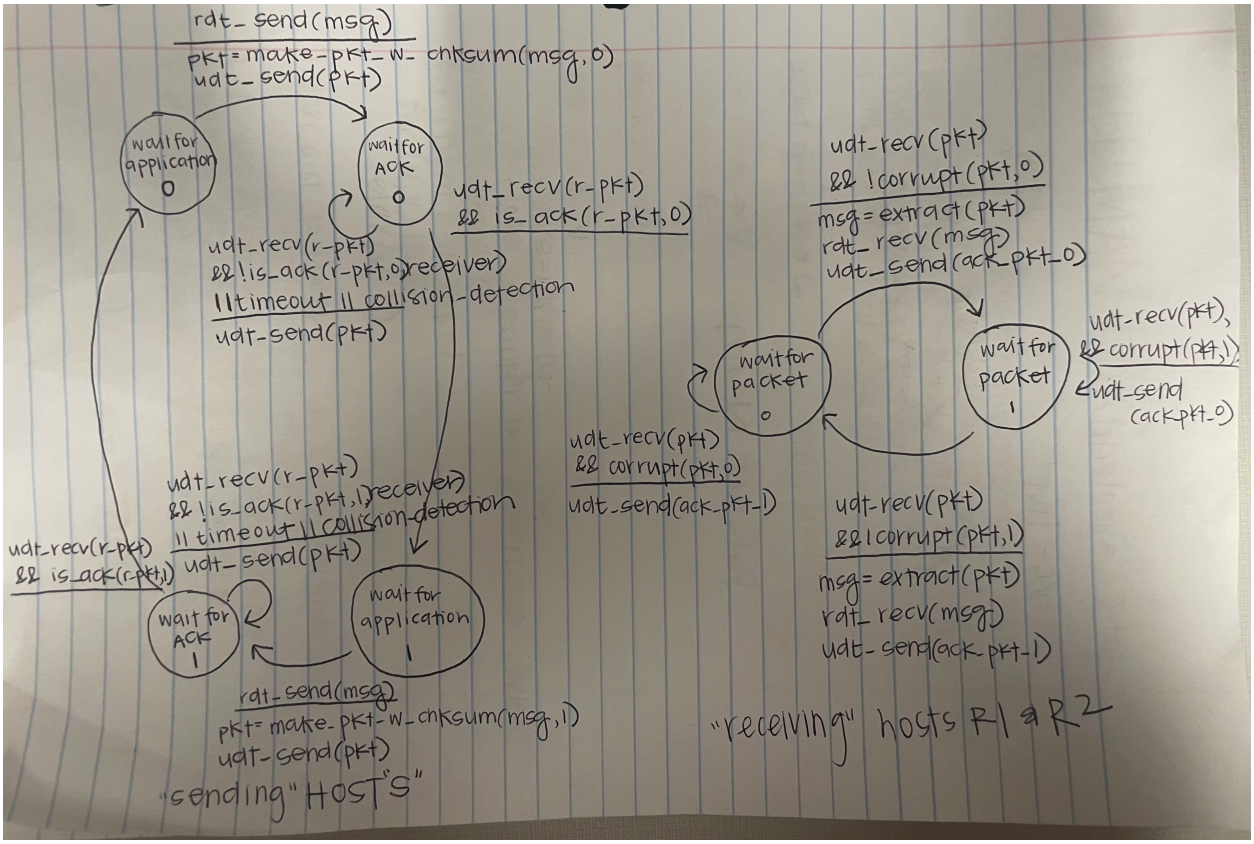
Question 1



Question 2 - Throttling

Flow Control - When a sending host (e.g., server) sends something to a receiving host (e.g., netbook), the sending host needs to make sure the receiver can process it fast enough and not become overwhelmed (i.e., flow control). So, flow control is all about one host not overwhelming another host. In TCP, a sender implements "flow control," and slowing its rate as needed. Receivers send the size of the receiving window, (i.e., the amount of free space in the buffer). The sender sends less data than the last receiving window. If the receiving window is ever 0 then the sender sends 1 byte at a time.

Congestion Control - Congestion control is not about one host overwhelming another, but is about what is happening on a network and if the network is overwhelmed (i.e., "congested"). When a network is overwhelmed, packets get delayed or dropped. TCP handles congestion control by slowing down transmission with lost packets and speeding up with acknowledged packets. This happens by sending a single segment at a time, or the Maximum Segment Size (MSS). The MSS is doubled each time sent. If a packet gets lost, then a slow start threshold is implemented. If the congestion window is every larger than the threshold, then it enters a mode called "congestion avoidance mode." If the connection gets three duplicate ACKS, it enters a mode called "fast recovery mode." In layman's terms, messages increase slowly when successfully transmitted and then decrease it rapidly when there is congestion.

Question 3 - NAT

What are *possible* values for the source and destination addresses and ports for packets:

- From A to X behind the NAT
  - SRC: 10.0.0.1 7743
  - DEST: 1.2.3.4 80
- From B to X behind the NAT
  - SRC: 10.0.0.2 9999
  - DEST: 1.2.3.4 80
- From A to X between the NAT and X
  - SRC: 193.1.2.3 11111
  - DEST:1.2.3.4 11112
- From B to X between the NAT and X
  - SRC: 193.1.2.3 11112
  - DEST: 1.2.3.4 80
- From X to A between X and the NAT
  - SRC: 1.2.3.4 80
  - DEST: 193.1.2.3 11111
- From X to A between the NAT and A
  - SRC: 1.2.3.4 80
  - DEST: 10.0.0.1 7743

What are there corresponding contents of the router's NAT translation table?

Inside		Outside
10.0.0.1	7743	11111
10.0.0.2	9999	11112

Question 4 - Routers

- How many subnets are a part of this network, and what is the smallest IP prefix (i.e., most fixed bits) that can be used to describe each one?

There are 6 subnets in this network,. There is subnet A, subnet B, subnet C, and then the link between each of them is a subnet (A->B, B->C, A->C). The smallest IP prefix (i.e, most fixed bits) for A, B, and C is 24. The most fixed bits for each of the links between the subnet is 31.

- If this network is somehow connected to the internet, what is the cheapest (i.e, smallest number of address) IP prefix the company could have purchased (without using NAT)?

The IP addresses purchased go from 1.1.1 until 1.1.6. So, this means there are 21 fixed bits, and 11 not fixed bits. Therefore, the smallest number of addresses the company could have

purchased without using NAT is 2^11 (since those bits are allowed to be changed). 2^11 = 2048.

- Assume the router for group A has 4 ports: port 1 is connected to the group subnet, port 2 is connected to router B, port 3 is connected to router C, and port D is connected to the ISP. Write out router A's forwarding table?

Port	Destination IP
1	1.1.1.0/24
2	1.1.4.1
3	1.1.5.1
4	0.0.0.0 //ISP address

Question 5 - Routing

Code is found in the folder "bellmanFord".

Graph: