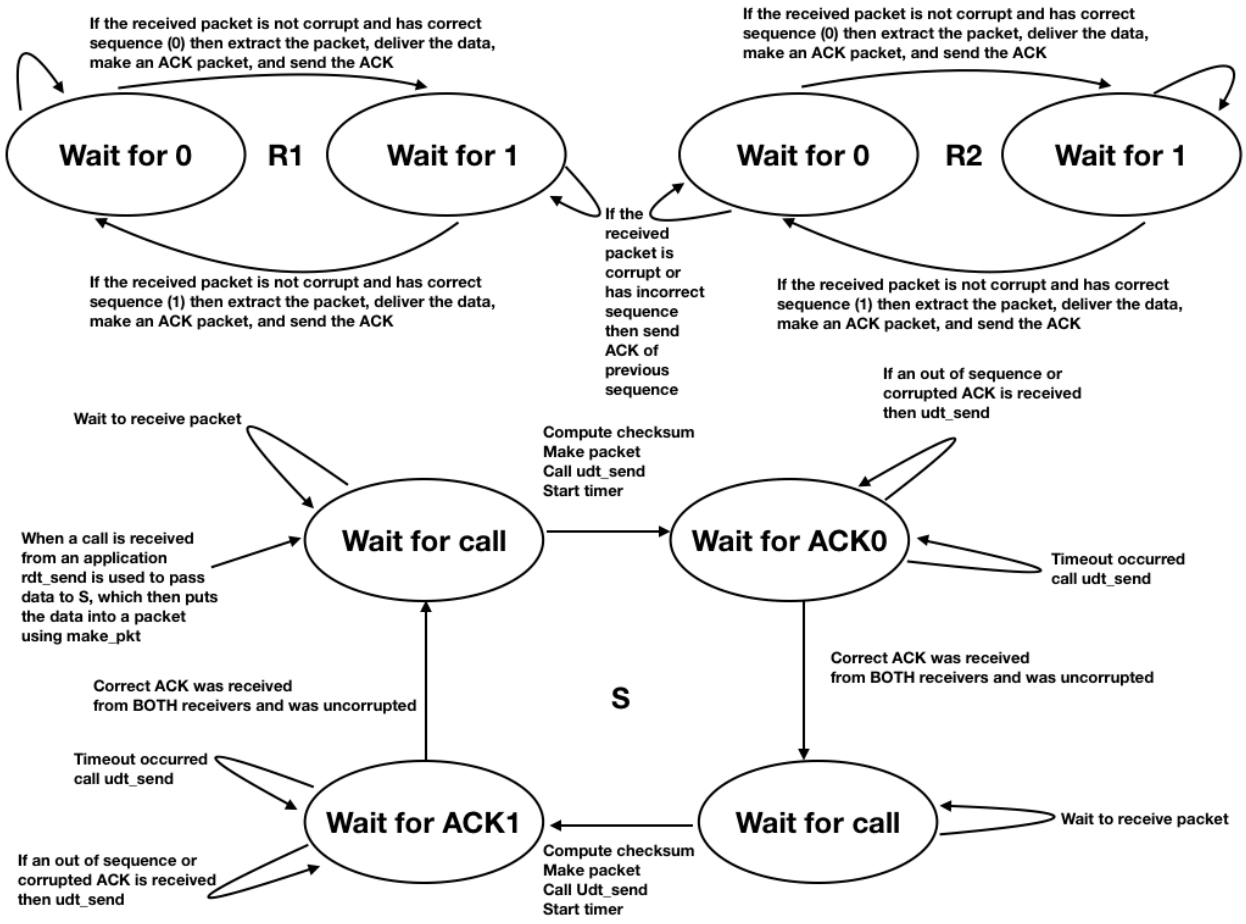
Question 1: Reliable data transfer



Question 2: TCP flow control vs congestion control

Flow control is to ensure that the sender does not overwhelm the receiver, by sending too many packets too quickly. In this way flow control is about communication between two end nodes. The TCP socket of the receiving application has a buffer that calculates a receive window, or the amount of space still available in the buffer. It makes this receive window available to the sender through an ACK. The sender will only send packets if the size of the receive window is greater than number of packets in flight.

All though both controls use windows congestion control differs from flow control in that it is intended to prevent a node from overwhelming the network. While flow control is controled by the link and transport layers, congestion control is controlled by the network and transport layers. In congestion control the transport layers slows transmission, instead of the sender. Importantly, congestion control is concerned with fairness. As congestion control affects all nodes on the network, each node should have the same acdcess to network resources. Congestion control employs a congestion avoidance algorithm. The sending of packets ramps up exponentially until the congestion avoidance phase (based on drop probability), then increase linearly. At packet loss there is a multiplicative decrease in packet sending. After loss there is an additive increase.

Question 3: NAT

from A to X behind the NAT: (10.0.0.1:8080, 1.2.3.4:80)
from B to X behind the NAT: (10.0.0.2:9200, 1.2.3.4:80)
from A to X between X and the NAT: (5.6.7.8:8080, 1.2.3.4:80)
from B to X between X and the NAT: (5.6.7.8:9200, 1.2.3.4:80)
from X to A between X and the NAT: (1.2.3.4:80, 5.6.7.8:8080)
from X to A between the NAT and A: (1.2.3.4:80, 10.0.0.1:8080)

The contents of the NAT table are:
10.0.0.1:8080, 5.6.7.8:8080
10.0.0.2:9200, 5.6.7.8:9200

Question 4: Routers

There are 6 subnets as part of this network.
1.1.1.0 - 24 fixed bits
1.1.2.0 - 24 fixed bits
1.1.3.0 - 24 fixed bits
1.1.4.0/1.1.4.1 - 31 fixed bits
1.1.5.0/1.1.5.1 - 31 fixed bits
1.1.6.0/1.1.6.1 - 31 fixed bits

/21 (fixed bits) was the cheapest prefix that could be purchased

router A's forwarding table:
1.1.1.x, port 1
1.1.2.x, port 2
1.1.3.x, port 3
everything else on port 4 (D)

Question 5: