HW#3

Questions: 65 pts/total

1. TCP vs. UDP (check the one(s) with the characteristics) (8 pts)

Characteristic	TCP	UDP
Connectionless		
Reliable transfer		
Less overhead		
Has congestion/flow control		
Used by DNS/SNMP protocol		
Error checking		
Has ACK		
Has Handshake		

Table 1: TCP vs. UDP

2. Given two 8-bit integers (1 0 1 1 1 0 0 0) and (1 1 0 0 1 0 1 1). Calculate the checksum (as in UDP/TCP). (4 pts)

3. Why does it mean by the "stop-and-wait" operation in the RDT protocols? Under such operations, how many packets can be sent out simultaneously? (2 pts)

4. Compare RDT versions (5 pts)

RDT version	Assumption(s)	Feature introduced
1.0		
2.0		
2.1		
2.2		
3.0		

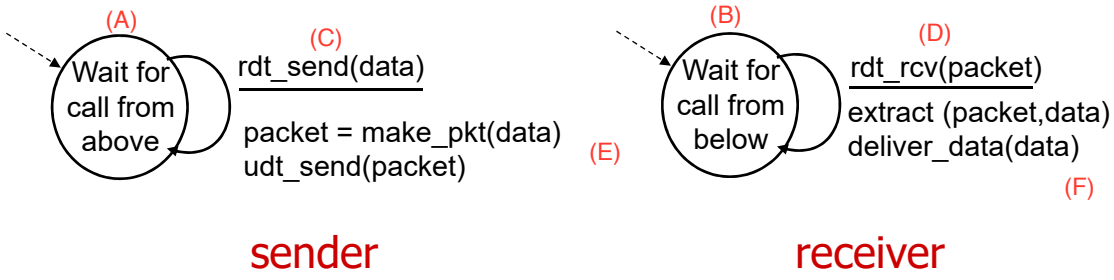
Table 2: RDT versions

5. RDT 1.0 (use (A) – (F) to answer the questions, 2pts/each)

   (a) What are the states in the given finite state machines?

(b) Which event is triggered when the sender receives data from the Application layer?

(c) Which action is taken when receiver receives the packet?



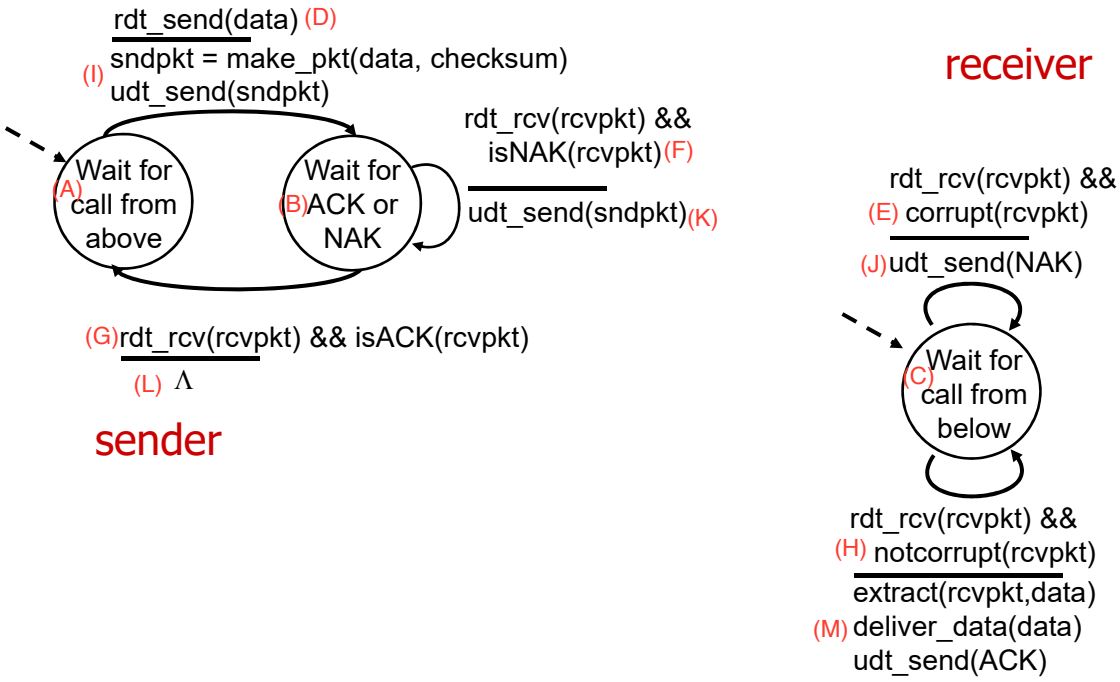
6. RDT 2.0, 2pts/each

(a) What is the meaning of (L)?

(b) If the receiver receives a corrupted packet, which action will be taken?

(c) What will happen when either the ACK or NAK is lost on transmission?

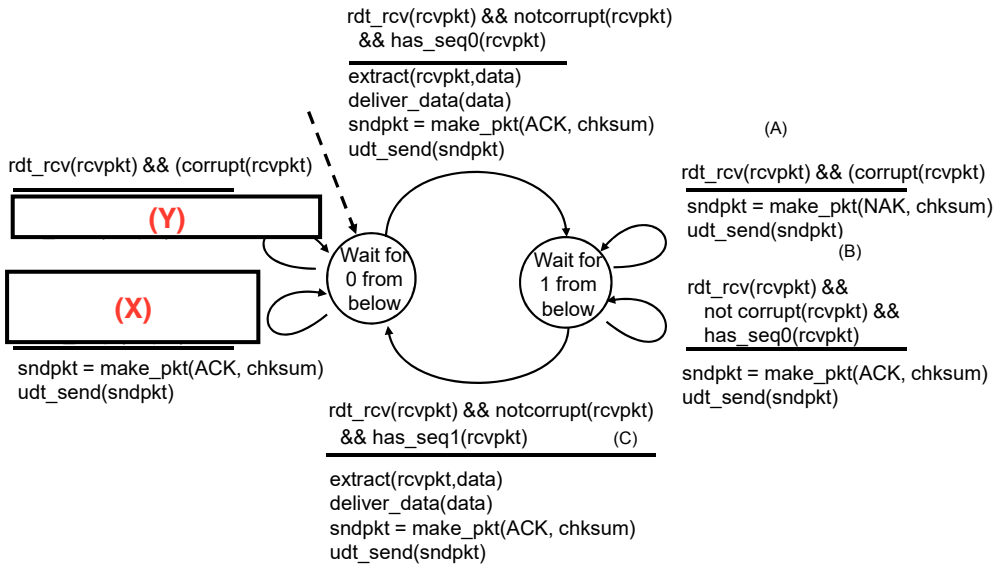
(d) Following the question above, what are the current states of the sender and receiver?



7. (RDT 2.1) We learn in class that the behaviors in higher versions of RDT protocols are symmetric. That is, the events and actions to handle the state with sequence number 0 is almost the same as those with sequence number 1.

   (a) Explain the event (in plain English) for (X). Also, write down the pseudo code for (X). Note: Try to use the rest of the diagram to identify the event. (4 pts)

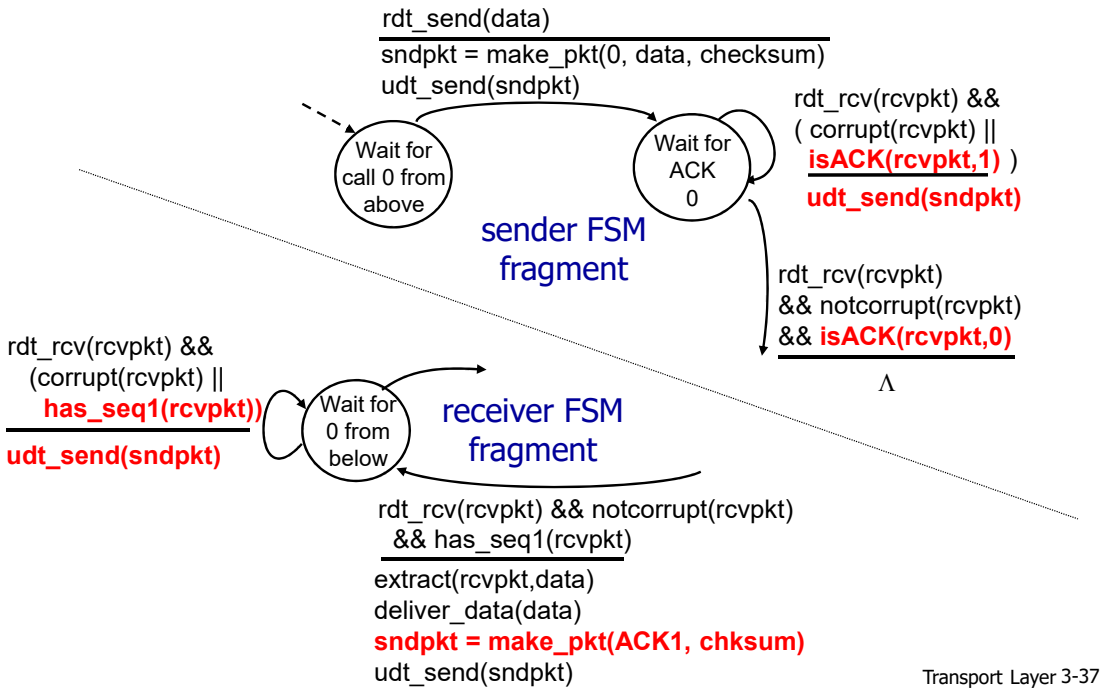
   (b) Explain the actions (in plain English) for (Y). Also, write down the pseudo code for (Y). Note: Try to use the rest of the diagram to identify the actions. (4 pts)



8. (RDT 2.2) Missing pieces. (2pts/each)

   (a) Identify the other half of the diagram for the sender's FSM (finite state machine).

   (b) What are the differences between the two halves?



9. (RDT 3.0) When do you start and stop the timer? (2 pts)
10. (RDT 3.0) When we go from RDT 2.2 to RDT 3.0, shall we have another FSM for the receiver? Explain why or why not. (4 pts)
11. (RDT 3.0) If the time set in the timer is too short, how does RDT 3.0 handle the duplicated packets? (2 pts)
12. All RDT protocols share the same issue that they may send the next packet only after receiving an ACK. How do we improve their performance? (2 pts)
13. Why do we need to have both sequence and acknowledge numbers? Briefly explain the dilemma of having only the sequence number in Selective Repeat. (4 pts)
14. (TCP) What are the required number of bytes in the TCP header? (2 pts)
15. Compare the differences between Go-back-N (GBN) and Selective Repeat (SR) (answer true or false). (4 pts)

Table 3: GBN vs SR

Characteristic	GBN	SR
Can send multiple packets in the pipeline		
Receive individual ACK per packet		
Has timer for the oldest unACKed packet		
Does not have a receiving buffer for out-of-order packet		

1 How to submit the assignment

All the assignments should be submitted electronically to GitHub.

If you prefer to write your answers on papers, please take photos of your written assignments and submit them to GitHub.

Note: If you upload photos, please make sure that the resolution and quality of the photos should be acceptable (readable.) If the quality is too bad so the instructor cannot read/understand your work, it will be rejected and you'll be required to redo the assignment.