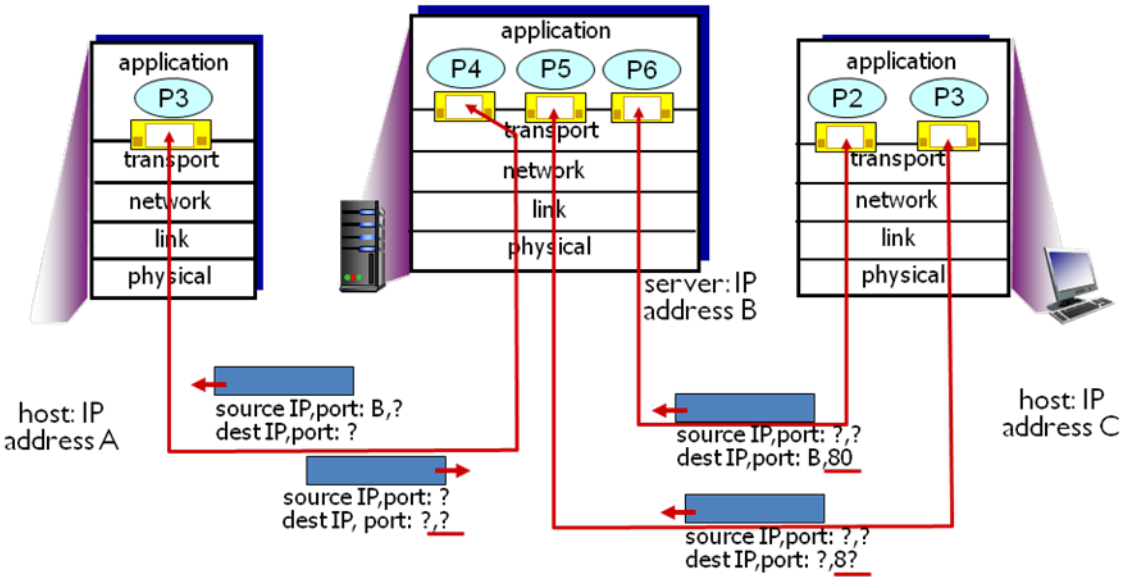
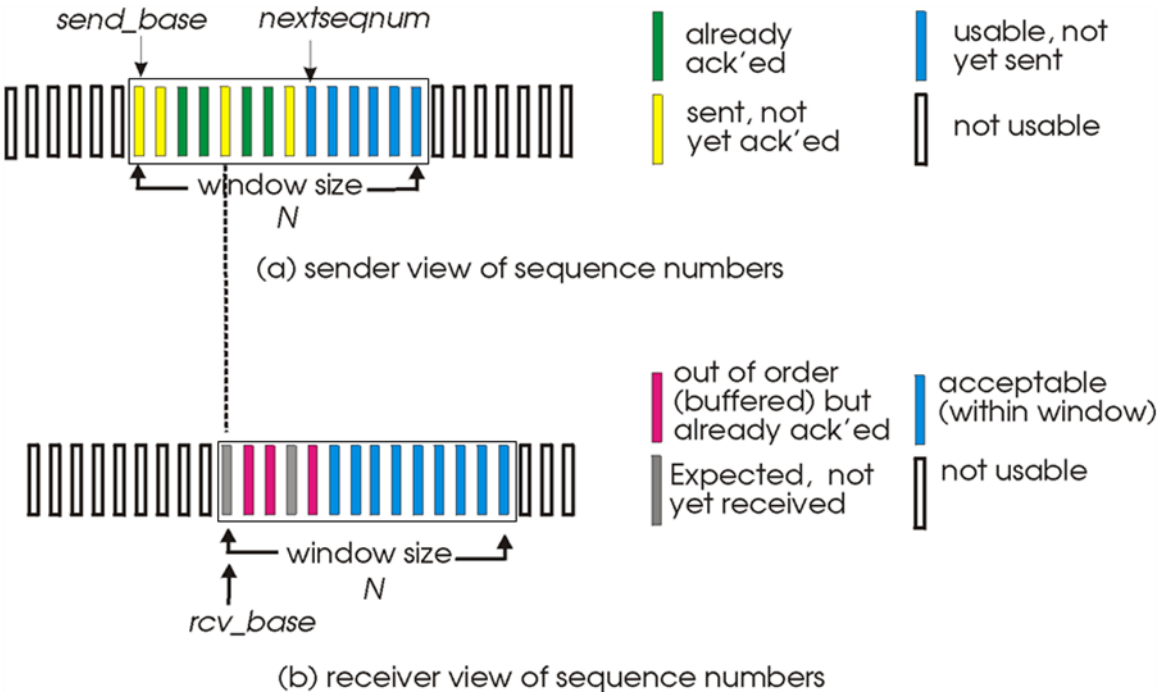
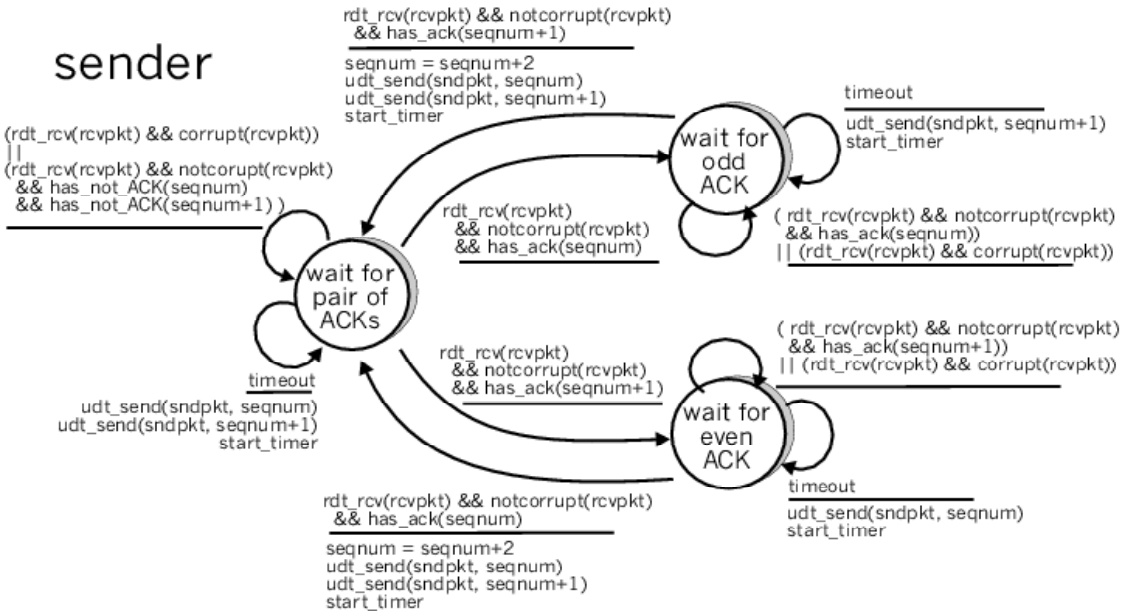
1. Transmission delays, propagation delays, queueing delays, and nodal processing delays are main reasons of packet delays. What order are they in terms of time? That is, please explain the four delays briefly and explain those four delay by the time order.
2. Packet switching seems to be the main way of networking. Please list and compare the merits and drawbacks of packet switching compared to circuit switching.
3. Encapsulation is common used in today's networking. Please describe three examples in networking which adopts the encapsulation technique.
4. What are design principles behind internet? Please list three and explain why?
5. There are seven layers in ISO/OSI model. Please explain them briefly from application layer to physical layer. What are the advantages of dividing the network protocol into layers? What are the possible problems behind it? Please also compare it with today's internet protocol stack.
6. DDoS (Distributed Denial of Service) is hard to trace and find the real attacker. Please explain what is DDoS? And explain if john was an attacker, what he would do to avoid being tracked.
7. What is client-server architecture? What is p2p architecture? Some says P2P is more scalable. Do you agree with it? Can the client-server architecture adapt to large scale of traffics. Why or why not? Why is most of today's company selecting client-server architecture or a combination of two to provide services?
8. TCP has implemented flow control and congestion control? Explain them both briefly. But with these two mechanisms, QoS parameters such as bandwidths, delays, and losses may still be met. Why?
9. ADSL and cable modem have different network topologies. Please describe how topologies differences may affect their performance.
10. Some applications such as POP3 and HTTP are stateless. Some maintain "states" such as IMAP. Please describe the advantages and disadvantages of both schemes.
11. Let a web page consist of many objects which include texts, graphs, and videos. What may we experience when we read the web page if we use a persistent HTTP with no parallel connections? What may we experience when we read the web page if we use a non-persistent HTTP?
12. What is web caching? Please draw a graph to explain the advantages of web paging.
13. There are four types in DNS Resource Records (RRs), what are they and what are they used for? If you want to let your file server and your mail server to have the same aliased name to your customer, how can the DNS help you? Please use an example to explain it.
14. What is DHT? What is circular DHT? How to handle peer churn? When there is a new joining node or a leaving node, how to maintain connection?
15. Write a pseudo code to show client-server socket interactions in TCP socket programming.
16. Some places are missing and are labeled with question marks (?). Please fill them of the following graph.

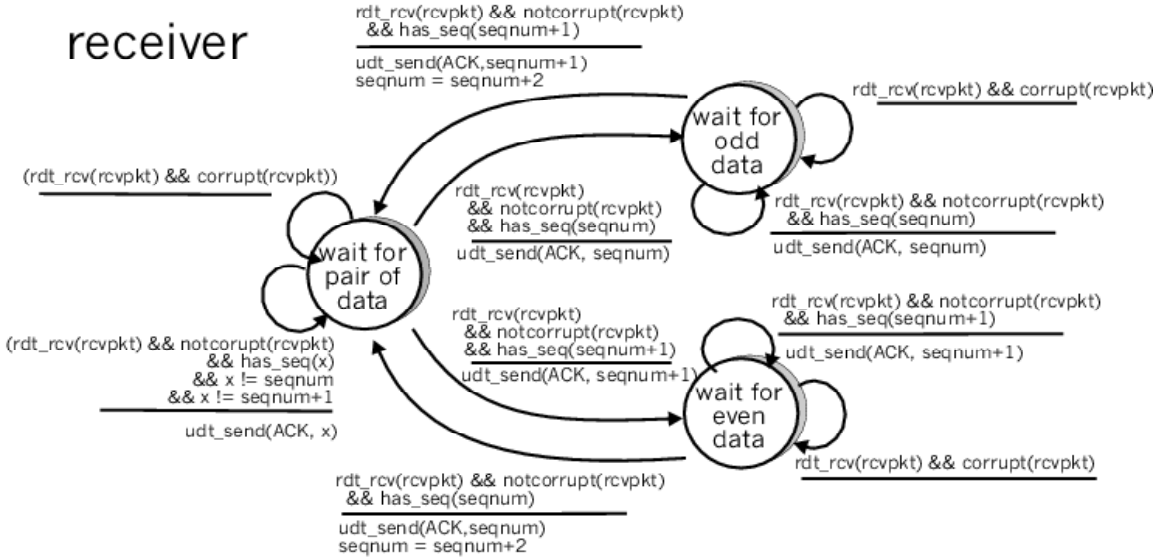


17. Are the following figures for selective repeat correct? Please explain the operations of selective repeat by using those two figures and identify and correct errors if there are.



18. Explain the operations of the following FSM (Hint: The send will send a pair of messages at a time). You can answer this problem on the problem sheet directly if you want. (10)





19. Briefly explain the operations of TCP congestion control. Your explanation must include slow star phase, congestion avoidance phase, and the condition of experiencing losses.
20. Please draw graphs to explain why 2-way hand shake may fail and 3-way hand shake are needed.
21. Consider a packet of length L which begins at end system A, travels over one link to a packet switch, and travels from the packet switch over a second link to a destination end system. Let d_i, s_i, and R_i denote the length, propagation speed, and the transmission rate of link i for $i = 1, 2$. The packet switch delays each packet by d_{proc}. Assuming no queueing delay, in terms of d_i, s_i, R_i, ($i = 1, 2$), and L, what is the total end-to-end delay for the packet?
    Suppose now the packet is 1000 bytes, the propagation speed on both links is 2.5 x 10^8 m/s, the transmission rates of both links is 1 Mbps, the length of the first link is 4000 km, and the length of the last link is 1000 km. For these values, what is the end-to-end delay?