

Assignment #2

CSc 4220/6220 - Computer Networks

September 21, 2017

→ *For CSc4220, students should answer one option for each Question 6 and 7*

→ *For CSc6220, students have to answer all question.*

→ *You should submit your own work except programming assignment.*

1. Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?
2. Describe how Web caching can reduce the delay in receiving a requested object. Will Web caching reduce the delay for all objects requested by a user or for only some of the objects? Why?
3. Consider an e-commerce site that wants to keep a purchase record for each of its customers. Describe how this can be done with cookies.
4. From a users perspective, what is the difference between the download-anddelete mode and the download-and-keep mode in POP3?
5. Consider an HTTP client that wants to retrieve a Web document at a given URL. The IP address of the HTTP server is initially unknown. What transport and application-layer protocols besides HTTP are needed in this scenario?
6. Consider a short, 10-meter link, over which a sender can transmit at a rate of 150 bits/sec in both directions. Suppose that packets containing data are 100,000 bits long, and packets containing only control (e.g., ACK or handshaking) are 200 bits long. Assume that N parallel connections each get $1/N$ of the link bandwidth. Now consider the HTTP

protocol, and suppose that each downloaded object is 100 Kbits long, and that the initial downloaded object contains 10 referenced objects from the same sender.

- (a) Would parallel downloads via parallel instances of non-persistent HTTP make sense in this case?
- (b) Now consider persistent HTTP. Do you expect significant gains over the non-persistent case?

Justify and explain your answer.

7. Consider distributing a file of $F = 15$ Gbits to N peers. The server has an upload rate of $u_s = 30$ Mbps, and each peer has a download rate of $d_i = 2$, ($\forall i \in \{1, 2, \dots, N\}$) Mbps and an upload rate of u . For $N = 10, 100$, and $1,000$ and $u = 300$ Kbps, 700 Kbps, and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both:

- (a) client-server distribution and
- (b) P2P distribution

8. **Programming Assignment:**

Based on the content covered in the class, you are required to implement a simplified network store-forward simulating program. You can conduct the homework by yourself or work with another student as a group. You are required to set up your system with computers to emulate the sender, receiver and router, which are connected as shown in the following figure.

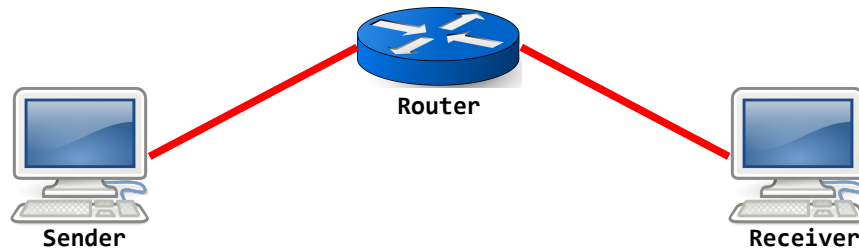


Figure 1: Network Transmission Model (Topology)

The sender will send Y packets (changing Y from 10, 20, 40, 60, 80, 100) via the router to the receiver. The receiver will reply with corresponding acknowledge packet as in the following figure. The router in the middle will randomly drop a packet with a probability $(10+X)\%$, where X is the last digit of your panther ID+ your partners last digit of the Panther ID. We further assume that the router only randomly drop data packets, not acknowledge packets.

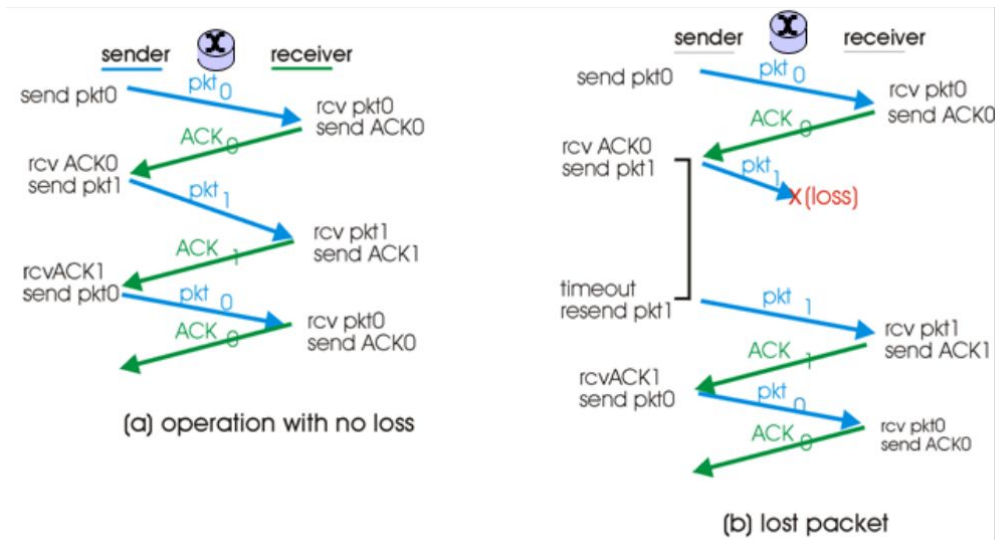


Figure 2: Packet transmission between sender and receiver

You have to:

- Implement programs (with your preferred programming language) running on the **sender**, **router**, and the **receiver** by using of TCP transmission protocol (sample code blocks in iCollege)
- Submit all your code blocks into the iCollege
- Demonstrate your program to the TA during the TAs office hour