

### CN3: EXERCISE 3

Submission deadline: 2019/11/12

(Please submit your report as one PDF file to taizucourse@gmail.com)

#### Lab questions:

Note:

- Try to work with a partner! If you have no partner, please use 2 terminal windows.
- In your answers, you should show the **new/modified code lines**. Also, show the **results** by the screen capture.
- The loop in the client is already done for you!

Please run the client and server (TCP) programs provided in our folder. Each program is run in a terminal window. (10 points each question)

1. Assign the server's IP address and port number to the client program and connect these two programs. Then modify the server program so that it can display the IP address and port number of the client.
2. Open one more terminal window and run another client in that window. Is there any problem when connecting to the server? Modify the server so that this client can send data to the server. Show the server's window to prove that it can handle both clients.  
*Hint:* replace the data processing loop by this thread call, which creates a thread (with a socket) for each client:

```
start_new_thread(handleClient,(connectionSocket,))
```

3. In the client program, now change the *server name* and *server port* to *www.google.com* and *80*. Connect the client to that new server, and then send the following request message:

```
"GET / HTTP/1.1\r\nHost: www.google.com\r\n\r\n"
```

Please show the reply message.

4. Compute the time delay of the above request-reply operation.  
*Hint:* the current time can be provided by the method `time.time()`
5. Repeat questions 3-4 with another web server you like.

#### Homework questions (each question = 5points)

Please answer the following questions. (You may ask teacher or TAs to help)

1. In TCP, what are the differences in the purposes of reliable data transfer, flow control, and congestion control?
2. Describe the steps when a client and a server close the TCP connection between them.
3. What is the meaning of Seq=92 and ACK=100 in the Fig. 1a?

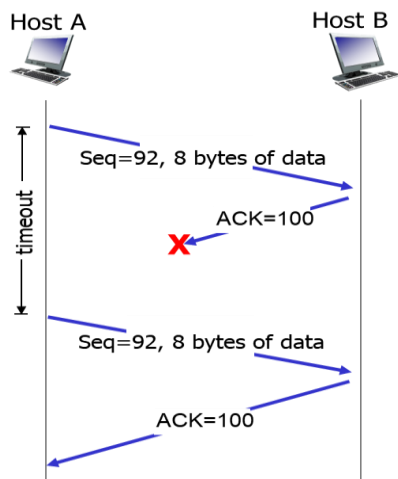


Fig. 1a

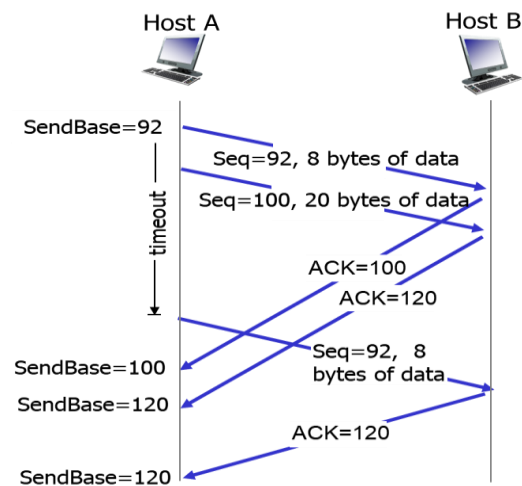


Fig. 1b

4. In Fig. 1b, why does the second ACK segment have ACK=120?
5. In Fig. 1b, why does host A resend segment with Seq=92?
6. In Fig. 1b, after receiving the resent segment with Seq=92, why does host B send the segment with ACK=120?
7. If a host receives three ACK segments with the same ACK values, what is its action? (Hint: see ACK-related slides of Lecture 7)
8. How can a TCP sender detect a loss?
9. Suppose a server is serving ONLY two TCP clients, each has one connection. How many sockets does the server have at least? Please explain.
10. Suppose a server is serving ONLY two UDP clients, each has one connection. How many sockets should the server have at least? Please explain.