

1. Suppose that a Web server runs in host C on port 80. Suppose this Web server uses persistent connections, and is currently receiving requests from two different hosts, A and B. Are all of the requests being sent through the same socket at host C? If they are being passed through different sockets, do both of the sockets have port 80? Discuss and explain.

A: Persistent connection使用TCP協定，由此判斷他是Connection-oriented，會記錄source IP、source port、destination IP、destination port，他們會經過不同在Host C的socket但他們的destination port number都會是80。

2. Describe how Web caching can reduce the delay in receiving a requested object. Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110.
- Suppose that the first segment is lost but the second segment arrives at B. In the acknowledgment that Host B sends to Host A, what will be the acknowledgment number?
 - How much data is in the first segment?

A: a. 1st segment沒收到，2nd segment收到了，但因為segment在90斷開了，所以他會回傳sequence number 90。
b. $110 - 90 = 20$, 1st segment 資料大小為 20

3. Consider the GBN protocol with a sender window size of 3 (packets) and a sequence number range of 1,024. Suppose that at time t , the next in-order packet that the receiver is expecting has a sequence number of k . Assume that the medium does not reorder messages. Then, what are the possible sets of sequence numbers inside the sender's window at time t ? Justify your answer.

A: $k - \text{window size} \sim k - 1 = k - 3 \sim k - 1 = \{k - 3, k - 2, k - 1\}$

4. Host A and B are directly connected with a 200 Mbps link. There is one TCP connection between the two hosts, and Host A is sending to Host B an enormous file over this connection. Host A can send application data into the link at 100 Mbps but Host B can read out of its TCP receive buffer at a maximum rate of 50 Mbps. Describe the effect of TCP flow control.

A: 因為發送端的傳輸速率大於接收端的傳輸速率，在接收端buffer被占滿時，會告知發送端先停止發送資料，直到接收端清除buffer中的資料，才會再發送可以繼續傳輸資料的TCP segment。

5. For TCP's estimation of RTT. Why do you think TCP avoids measuring the SampleRTT for retransmitted segments?

A: 避免一些錯誤的SampleRTT被記錄，才會有較準確的estimation RTT，假設一筆資料(package1)被判定為timeout，資料開始進行重傳(package2)，但此時package1的資料比package2早送達，會被紀錄為package2已送達，從而產生一個較短且不真實的SampleRTT，對estimation RTT有錯誤的估計值。