Theoretical Questions on TCP

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1 Theoretical Questions

1. Assuming two machines are connected to the same local area network, if they exchange UDP or TCP traffic, does fragmentation occur? Indicate in which cases and the reason. Would there be fragmentation outside the local network?

2. What is the cause of packet loss in TCP/IP?

3. In TCP, if a server (receiver) finishes sending data and has nothing else to do, can it send the FIN without waiting for the sender? What is this called? Can the sender still send more data?

4. If a server receives an RST in response to its (SYN,ACK) accepting the connection, what happens in that case? Would the passive socket be closed? Would the (SYN,ACK) be retransmitted? Would a timeout occur?

5. What effective window does Nagle authorize when in use for the first segment that is sent if nothing is pending acknowledgment? When we study slow start and congestion avoidance, return here to determine which massive traffic algorithm it resembles more: slow start (with what window (cwnd) value?) or congestion avoidance?

6. What is WIN used for in a TCP connection? Is the parameter different for the receiver or the sender, or does it have to be the same?

7. What is the best window in the absence of flow control limits and without congestion issues? The largest window, whatever it may be? The smallest possible (what would it be)? The product of bandwidth and round-trip time (BW[1]×RTT)? Why?

8. What is the RTO? What parameters does the Jacobson algorithm take into account for calculating the retransmission timer? Why is it necessary to have a good estimate of the RTT?

9. What does the Karn/Partridge algorithm consist of?

[1] in terms of segments per second

10. Would you say that a TCP receiver can reduce the advertised window size in response to congestion in the routers along the path?

11. The fast recovery / fast retransmit mechanism allows the sender to retransmit the lost segment without waiting for the retransmission timer to expire. How does the window grow until the lost segment arrives (in slow start or congestion avoidance)?

12. About TCP windows
    (a) What is the congestion window (cwnd)? When does its value change?

(b) What is the advertised window (WIN)? How do we find its value?

(c) What is the effective window? How is it calculated?

(d) What is the continuous sending window? How is it calculated?

(e) What is the relationship between the windows regarding the number of segments that can be sent per RTT? (Indicate how each one influences the number of segments sent per RTT)

13. What do we call the situation in which the rate of data that the sender can transmit is much higher than what the receiving application can read, and therefore the receiver sends window updates smaller than half of its buffer and the MSS (in this situation, very small datagrams (tinygrams) are sent)? How is it avoided?

14. What is the purpose of the TCP timer called `keep-alive`?

15. Suppose that in a TCP connection between A and B, one of the ends (B) is only receiving data and its receive buffer is full. If the buffer is eventually freed and B sends an acknowledgment indicating the situation, but the acknowledgment is lost, a deadlock would occur. What mechanism is used in TCP to prevent this deadlock?