

Lecture 11: TCP Implementation Quiz ANS

1. In real TCP, what is the primary unit used for sequence numbers and ACKs?

- A. Packets
- B. Bytes
- C. Segments
- D. Frames

ANS:

2. What does the sequence number field in a TCP header represent for a data segment?

- A. The number of the last byte carried in the segment
- B. The count of bytes transmitted so far on the connection
- C. The number of the first byte of data in the segment
- D. The total number of segments sent so far

ANS:

3. Suppose a TCP sender transmits a segment with sequence number j carrying B bytes. If all prior data has been received in order, what ACK value will the receiver send after correctly receiving this segment?

- A. j
- B. $j + B - 1$
- C. $j + B$
- D. $j + 2B$

ANS:

4. In normal operation with one packet in flight, no loss, and fixed segment size B , how are the ACK number and next sequence number at the sender related?

- A. ACK number is always smaller than the next sequence number
- B. ACK number equals the next sequence number
- C. ACK number is always larger than the next sequence number
- D. There is no simple relationship

ANS:

5. Why does TCP choose a random Initial Sequence Number (ISN) for each new connection?

- A. To minimize header overhead
- B. To ensure that segments are aligned to MSS boundaries
- C. To improve security and avoid confusion with stale segments from old connections
- D. To simplify retransmission timeout estimation

ANS:

6. If all bytes up to and including ISN+219 have been received correctly, which ACK value will the receiver send next?

- A. ISN + 219
- B. ISN + 220
- C. ISN + 218
- D. ISN + 221

ANS:

7. Which combination of TCP header fields is primarily responsible for implementing reliability?

- A. Source port and destination port
- B. Sequence number, acknowledgment number, and checksum
- C. Advertised window and header length
- D. Flags and urgent pointer

ANS:

8. If an ACK for byte 100 is lost but later an ACK for 120 arrives. What can Host A infer from the ACK=120?

- A. Only bytes 100–119 were received; 92–99 must be retransmitted
- B. All bytes up to 119 have been received, including 92–99 and 100–119
- C. Only the segment starting at 120 was received
- D. The connection should be reset

ANS:

9. TCP connections are full-duplex. What does this mean in practice?

- A. Data can only flow in one direction at a time, but the direction can switch
- B. Both hosts can send and receive data simultaneously over the same connection
- C. The connection uses separate ports for sending and receiving
- D. Each segment can carry data or acknowledgments, but not both

ANS:

10. In a full-duplex TCP connection, how many independent sequence-number spaces are used?

- A. One, shared by both directions
- B. Two, one for each direction A→B and B→A
- C. Four, one per host and per port
- D. One per segment

ANS:

11. What is the main purpose of the three-way handshake in TCP connection setup?

- A. To exchange congestion window sizes
- B. To synchronize IP addresses between client and server

- C. To allow each host to learn the other's ISN and establish ISNs (initial sequence-numbers)
- D. To negotiate MTU along the path

ANS:

12. During normal TCP connection termination, what does a FIN flag indicate?
- A. The sender will neither send nor receive any more data
 - B. The sender is done sending but will continue to receive data
 - C. The sender is aborting the connection immediately
 - D. The sender is requesting a higher advertised window

ANS:

13. How does the behavior of a TCP RST segment differ from a FIN segment?
- A. RST must be acknowledged while FIN does not
 - B. RST closes only one direction; FIN closes both
 - C. RST immediately aborts the connection without requiring an ACK, discarding in-flight data
 - D. RST is used only during connection setup

ANS:

14. In the TCP state machine, which state represents a connection that is fully open and exchanging data?
- A. SYN_SENT
 - B. LISTEN
 - C. ESTABLISHED
 - D. TIME_WAIT

ANS:

15. In TCP's byte-based sliding window, a sender maintains a single retransmission timer rather than one timer per segment. Under what condition does the sender retransmit without waiting for the timer to expire?
- A. When any ACK is received for a byte inside the current window
 - B. When three duplicate ACKs for the same byte are received
 - C. When the advertised window drops to zero
 - D. When the congestion window exceeds the receiver's advertised window

ANS:

16. What is "piggybacking" in the context of TCP?
- A. Sending data without any ACKs
 - B. Delaying data segments until the congestion window grows
 - C. Combining ACK information with outgoing data in the same segment
 - D. Using multiple connections over the same port

ANS:

17. Why are SYN-ACKs always piggybacked in TCP?

- A. Because data must always be sent with SYN segments
- B. Because the OS, not the application, performs the handshake and can easily combine SYN and ACK in one control segment
- C. To reduce the number of sequence-number spaces needed
- D. To avoid triggering congestion control

ANS:

18. In the TCP sliding-window scheme (measured in bytes), what does the window [first_unacked, first_unacked + W) represent?

- A. All bytes that have been successfully sent and acknowledged
- B. The set of bytes that are in flight but not be acknowledged yet
- C. The total buffer space at the receiver
- D. The advertised congestion window only

ANS:

19. Which events cause the sliding window to move (slide) forward?

- A. Any ACK that is received for any byte within the window
- B. ACKs that acknowledge the leftmost unacked bytes, thereby advancing the first unacked byte
- C. Timer expirations only
- D. Arrival of out-of-order data at the receiver

ANS: B

20. TCP sets its effective send window W as the minimum of two quantities. Which two?

- A. Congestion window and MSS
- B. Receiver advertised window and MSS
- C. $\min(\text{RWND}, \text{CWND})$, Congestion window and receiver advertised window
- D. RTT estimate and MSS

ANS: