

1 General Questions - UDP/TCP

1. Why does UDP exist? Would it not have been enough to just let user processes send raw IP packets?

2. Both UDP and TCP use port numbers to identify the destination entity when delivering a message. Give two reasons why these protocols invented a new abstract ID (port numbers), instead of using process IDs, which already existed when these protocols were designed.

3. Datagram fragmentation and reassembly are handled by IP and are invisible to TCP. Does this mean that TCP does not have to worry about data arriving in the wrong order?

4. Why is the maximum payload of a TCP segment 65495 Bytes? Hint: Look at the IPv4 header.

2 TCP Connection

1. Assume that Alice and Bob are communicating using a chat program over a TCP connection. The header of each chat message is 80 B long. The data is ASCII encoded. The following exchange takes place:

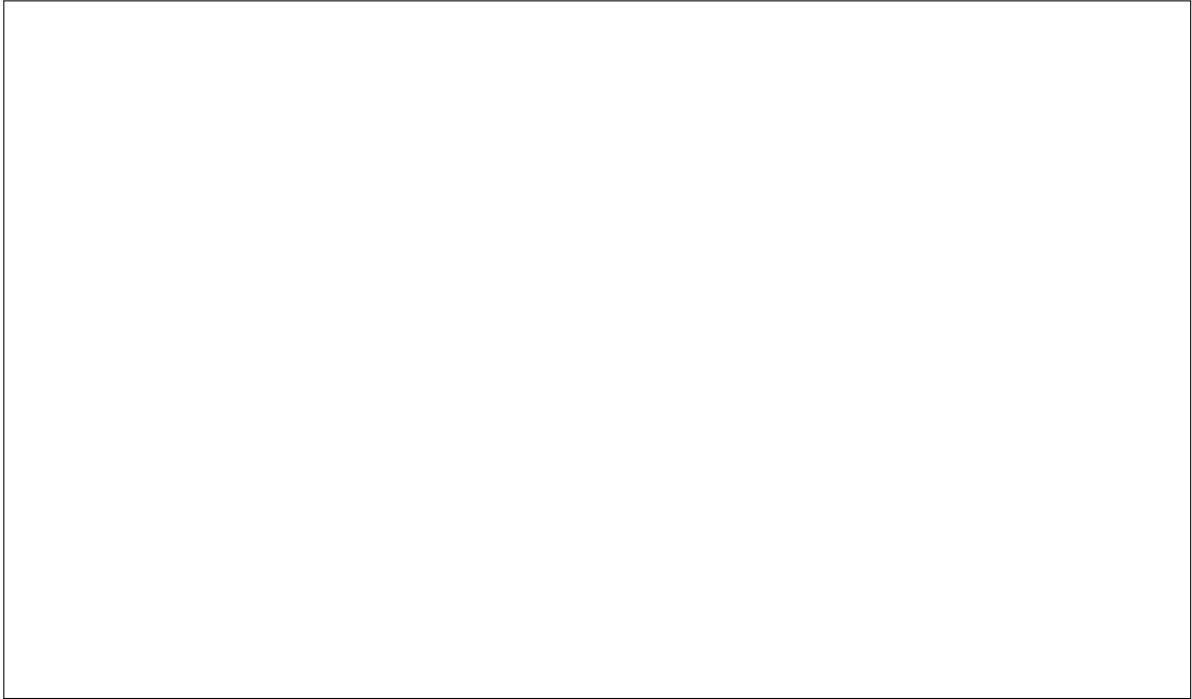
Alice Where are you from?

Bob I'm from Berlin.

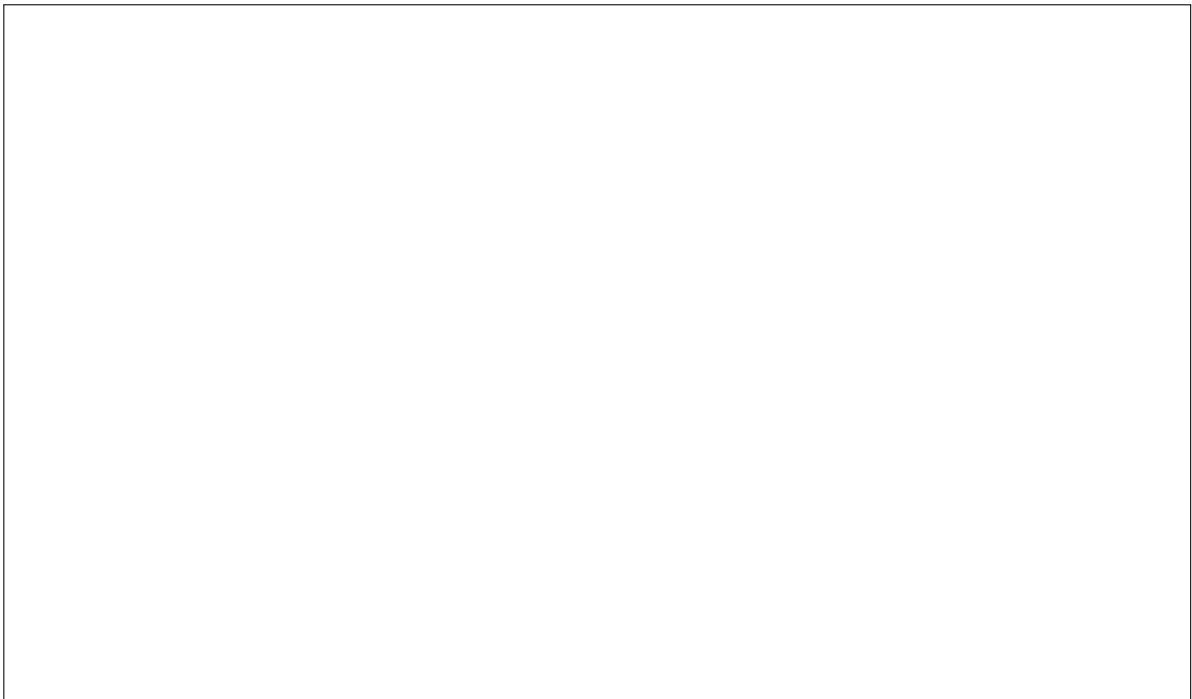
Alice Nice to meet you.

Bob Nice to meet you too.

Draw a diagram depicting the sequence and acknowledgement numbers of the chat session. Assume, that the Alice's $ISN = 3072$ and Bob's $ISN = 571$. (ISN : initial sequence number)



2. Draw a sequence diagram of a scenario showing the use of cumulative acknowledgements and piggyback acknowledgements.



3 TCP Timeout

1. A host measures the following RTT's from a TCP connection.

Time step	0	1	2	3	4	5
RTT [ms]	300	330	234	317	280	266

Calculate the TCP estimated retransmission timeouts, using $\alpha = 0.125$ and $\beta = 0.25$. Assume that the RTT estimate at $t = 0$ is 300 ms, and the corresponding deviation estimate is 20 ms.