

Homework Assignment 4: 100 points

Due date: Dec. 3, 2023 (Sunday)

Question 1: (10 points)

Regarding the IP fragmentation, suppose that there is a datagram of 5000 bytes, and the MTU of the link is 1000 bytes. How many datagrams will be generated after the IP fragmentation, and why?

Question 2: (10 points)

- (a) What does “CIDR” refer to? (5 points)
- (b) What does “DHCP” refer to? (5 points)

Question 3: (10 points)

Regarding the shortage of the IPv4 addresses, please specify two ways to address this issue of the shortage of the IPv4 addresses.

Question 4: (20 points)

- (a) To identify a TCP socket, what are the 4-tuple information required? (5 points)
- (b) To identify a UDP socket, what are the 2-tuple information required? (5 points)
- (c) What are the differences between TCP and UDP? (10 points)

Question 5: (5 points)

What are the three mechanisms to realize the reliable data transfer protocols?

Question 6: (15 points)

Consider the situation of reliable data transfer. Each packet size is 5000bits. The link bandwidth is 5Mbits/sec. The single-trip signal propagation delay is 0.005sec.

- (a) What is the utilization ratio of this link if the stop-and-wait based reliable data transfer protocol is adopt? (5 points)
- (b) How to improve the utilization ratio of this link? To make a full utilization of the link, what is the maximum number of packets which can be sent without requiring acknowledgement? (5 points)
- (c) What are the differences between the GBN protocol and selective repeater protocol?

Question 7: (20 points)

- (a) What are the differences between TCP congestion control and TCP flow control? (5 points)
- (b) What are the three mechanisms used for TCP congestion control? (10 points)
- (c) Please explain why TCP needs to perform the fast-transmission mechanism after receiving three duplicated ACKs? (5 points)

Question 8: (10 points)

- (a) What does DNS refer to? (5 points)
- (b) What are the two query-schemes used by DNS? (5 points)