Chapter 6: Sample Questions, Problems and Solutions
Bölüm 6: Örnek Sorular, Problemler ve Çözümleri

Örnek Sorular (Sample Questions):

- What are services of the transport layer provided to the upper layers?
- What are the transport service primitives?
- What are Berkeley sockets?
- What are the differences between the data link layer and the transport layer?
- What is an end point or port in the Internet?
- What is TSAP (Transport Service Access Point)?
- What is NSAP (Network Service Access Point)?
- What are three protocol scenarios for establishing a connection using a three-way handshake?
- What is the two army problem during connection release?
- What are four protocol scenarios for releasing a connection?
- What is upward and downward multiplexing related to the transport layer?
- Draw and explain the UDP header.
- Give examples where the UDP is used.
- What is Remote Procedure Call?
- What is the Real-Time Transport Protocol?
- Give the examples for ports
- What is the MTU (Maximum Transfer Unit)?
- What is TCP?
- Draw and explain the TCP header.

Örnek Problemler ve Çözümleri (Sample Problems and Solutions):

(Chapter 6, Problem 14)

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

ANS:
No. IP packets contain IP addresses, which specify a destination machine. Once such a packet arrived, how would the network handler know which process to give it to? UDP packets contain a destination port. This information is essential so they can be delivered to the correct process.

(Chapter 6, Problem 16)

A client sends a 128-byte request to a server located 100 km away over a 1 GB optical fiber. What is the efficiency of the line during the remote procedure call?

ANS:
Sending 128x8=1024 bits over a 1 Gbps line takes ~1 microsec.
The speed of light in fiber optics is 200 km/millisec, so it takes 0.5 millisec for the request to arrive and another 0.5 millisec for the reply to get back. In all, 1024 bits have been transmitted in 1 millisec. This is equivalent to 1 megabit/sec, or 1/10 of 1% efficiency.

(Chapter 6, Problem 19)

What is the total size of the minimum TCP MTU (Maximum Transmission Unit), including TCP and IP overhead but not including data link layer overhead?

ANS:
The default segment is 536 bytes.
TCP adds 20 bytes and so does IP, making the default 576 bytes.

(Chapter 6, Problem 21)

RTP is used to transmit CD-quality audio, which makes a pair of 16-bit samples 44,100 times/sec, one sample for each of the stereo channels. How many packets per second must RTP transmit?

ANS:
Each sample occupies 4 bytes. This gives a total of 256 samples per packet. There are 44,100 samples/sec, so with 256 samples/packet, it takes 44100/256 or 172 packets to transmit one second's worth of music.

(Chapter 6, Problem 25)

The maximum payload of a TCP segment is 65,495 bytes. Why was such a strange number chosen?

ANS:
The entire TCP segment must fit in the 65,515-byte payload field of an IP packet. Since the TCP header is a minimum of 20 bytes, only 65,495 bytes are left for TCP data.

(Chapter 6, Problem 33)

In a network that has a maximum TPDU size of 256 bytes, a maximum TPDU lifetime of 30 sec., and a 4 bit sequence number, what is the maximum data rate per connection?

ANS:
For 4-bit sequence number we can number 2^4=16 TPDU. So the sender may not send more than 16 TPDU, or 16x256x8 bits=32768 bits, in 30 sec.
The data rate is thus no more than 32768:30=1092,26 bits per second or 1.092 Kbps

(Chapter 6, Problem 34)

Suppose that you are measuring the time to receive a TPDU. When an interrupt occurs, you read out the system clock in milliseconds. When the TPDU is fully processed, you read out the clock again. You measure *0 msec* 270,000 times and *1 msec* 730,000 times. How long does it take to receive a TPDU?

ANS:
Compute the average: (270,000*0 + 730,000*1 msec)/1,000,000. It takes 730 µsec.

(Chapter 6, Problem 40)

For a 1 Gbps network operating over 4000 km, the delay is the limiting factor, not the bandwidth. Consider a MAN with the average source and destination 20 km apart. At what data rate does the round-trip delay due to the speed of light equal the transmission delay for a 1 KB packet?

ANS:
The speed of light in fiber and copper is about 200 km/millisec.
For 20 km line, the delay is 100 microsec one way and 200 microsec round trip.
A 1 KB packet has 8192 bits.
If the time to send 8192 bits and get the acknowledgement is 200 microsec, the transmission and propagation delay are equal.
If B is the bit time, then we have 8192 x B =2/10000 sec or 1/5000 sec.
The data rate, 1/B, is then about 40 Mbps.

(Chapter 6, Problem 42)

What is the bandwidth – delay product for a 50 Mbps channel on a geostationary satellite? If the packets are all 1500 bytes (including overhead), how big should the window be in packets?

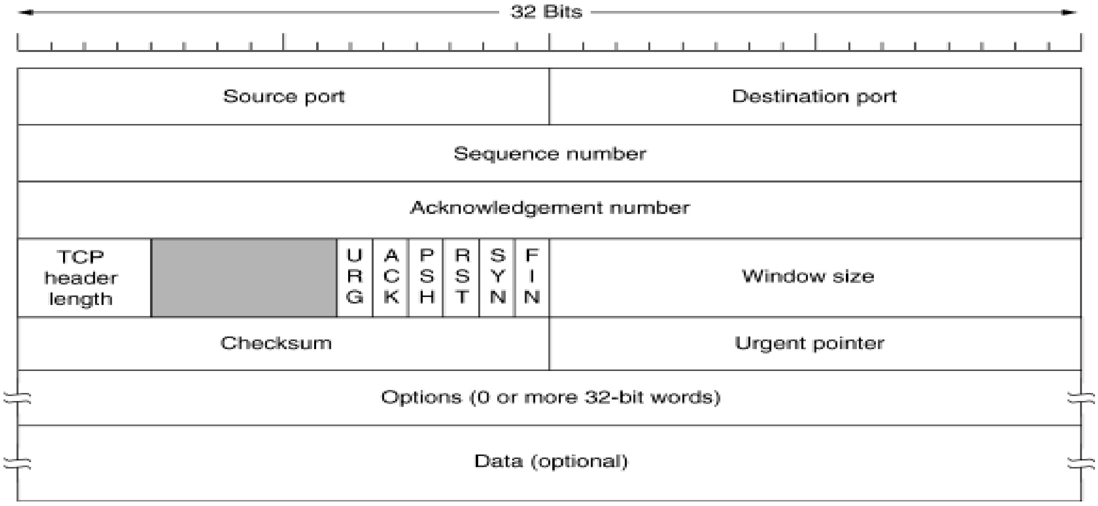
ANS:

The round-trip delay is about 540 millisec, so with a 50 Mbps channel the bandwidth product delay is 27 megabits or 3 375 000 bytes. With packets of 1500 bytes, it takes 2250 packets to fill the pipe, so the window should be at least 2250 packets.

(Chapter 6.5.4)

Sketch and describe the TCP segment header of the TCP Protocol.

ANS:



(Chapter 6, pp. 500-501)

Which problem does the three-way handshake solve and give three protocol scenarios for establishing a connection using a three-way handshake.

ANS: