Chapter 6

1. The maximum payload of a TCP segment is 65495 bytes. Why was such a strange number chosen?

Answer: the TCP header is minimum of 20 bytes, only 65495 bytes are left for TCP data

2. If the TCP round-trip time RTT is currently 30 msec and the following acknowledgements come in after 26, 32 and 24 msec, respectively, what is the new RTT estimate using the Jacobson algorithm? Use a = 0.9.

Answer: The successive estimates are 29.6 , 29.84 , 29.256

3. In a network that has a maximum TPDU size of 128 bytes, a maximum TPDU lifetime of 30 sec, and an 8-bit sequence number, what is the maximum data rate per connection?

Answer: the maximum data rate is 8.704 kbps.

4. To get around the problem of sequence number wrapping around while old packets still exist, one could use 64-bit sequence number. However, theoretically, an optical fiber can run at 75 Tbps. What maximum packet lifetime is required to make sure that future 75 Tbps networks do not have wraparound problems even with 64-bit sequence numbers? Assume that each byte has its own sequence number, as TCP does.

Answer: The size of sequence space is 2^{64} bytes.

so 75 Tbps transmitter uses up sequence space at a rate of 9.375×10^{12} sequence numbers/s

so it takes $\frac{2000000}{86400} = 23.15$ days to wrap around

Chapter 7

∴ A maximum packet lifetime is less than 24 days

1. Can a machine with a single DNS name have multiple IP addresses? How could this occur?

Answer: Yes, it can. If a machine has two Ethernet cards, it can be on two separate network, if so, it needs two IP Address.

2. A binary file is 3072 bytes long. How long will it be if encoded using base64 encoding, with a CR+LF pair inserted after every 80 bytes sent and at the end?   ∴ need 52 (CR+LF)

Answer: $\frac{3072}{3} \times (3+1) = 4096$ bytes $\frac{4096}{80} = 51$ ⋯⋯ 16 bytes   ∴ it's 4096 + 52 × 2 = 4200 bytes long

3. From an ISP's point of view, POP3 and IMAP differ in an important way. POP3 users generally empty their mailboxes every day. IMAP users keep their mail on the server indefinitely. Imagine that you were called in to advise an ISP on which protocol it should support. What considerations would you bring up?

Answer: Sorting user's emails takes up disk space, this factor argues for using POP3 But, the ISP would charge for storage above a few megabytes, thus turning email into a moneymaker, which argues for IMAP to encourage user to keep email on the server

4. The standard http URL assumes that the Web server is listening on port 80. However, it is possible for a Web server to listen to some other port. Devise a reasonable syntax for a URL accessing a file on a nonstandard port

Answer: The URL can be

$$http://dns-name:port/file$$

5. Imagine that someone in the CS Department at Stanford has just written a new program that he wants to distribute by FTP. He puts the program in the FTP directory ftp/pub/freebies/newprog.c. What is the URL for this program likely to be?

Answer: The URL can be

$$ftp://www.cs.stanford.edu/ftp/pub/freebies/newprog.c$$