# Chapter 6

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

The max payload field of a datagram is 65535 Bytes. Since IP header would take 20Bytes and TCP header would take at least 20 Bytes, the maximum payload of a TCP segment would be 65535-20-20 = 65495 Bytes.

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.

ERTT = a\*IRTT + (1-a)\*NRTT (a=0.9) && RTT0 = 30 msec

RTT1 = 0.9\*RTT0 + 0.1\*26 = 29.6

RTT2 = 0.9\*RTT1 + 0.1\*32 = 29.84

RTT3 = 0.9\*RTT2 + 0.1\*24 = 29.256

Thus, the new RTT estimate using the Jacobson Algorithm is 29.256 msec

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?

For 8-bit sequence number, we can number 28 = 256 TPDU.

Thus, in 30sec, the sender may not send more than 256 TPDU, which would be 256\*128\*8 =262144bits

Maximum\_data\_rate\_per\_connection=262144/30=8738.13bit/s=8.53kbps

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.

64-bit sequence number will wrap around after：

(264 \* 8)bits/(75 \* 1012)bit\*sec-1 = 1.97 \* 106 sec

Thus, to make sure 75 Tbps networks do not have wraparound problem with 64-bit sequence numbers, the maximum packet lifetime should less than 1.97\*106 sec(for about 22.7 days).

# Chapter 7

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

Yes, a machine with a SINGLE DNS name COULD have MULTIPLE IP addresses.

Firstly, one machine would have multiple IP addresses if it have multiple network interfaces.

Secondly, DNS doesn’t distinguish whether the multiple IP addresses belong to one machine or not. It may provide clients with IP addresses within a specific pool, or using a round robin method to cycle between the pool of IP addresses.

1. 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?

n\_group = 3072/3 = 1024 -> n\_byte = 4\*1024 = 4096

n\_line = ceil(4096/80) = ceil(51.2) = 52

Thus, we should add 52\*(CR+LF)

total\_byte = 4096 + 52\*2 = 4200 Bytes

So, the length of base64 coding in the ed would be 4200 Bytes.

1. 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?

I would suggest them support IMAP, but they should define a appropriate duration to delete most email in the mailbox, for the long-term existence would be an extremely taxing on the server, and most of them might be useless.

However, the users should be given the right to keep a limited number of emails indefinitely, for it might be pretty important.

Besides, IMAP protocol enables users to choose only download SOME of the received mails and could only read them when they are connected to the server, which would be more safe and storage-space-saving.

1. 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

SYNTAX: protocol://hostname[:port]/path/[paremeters][?query][#fragment]

If I want to accessing a file on port 8080 at localhost, the URL might be:

<http://localhost:8080/index.html>

1. 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?

Suppose the URL of Standford’s CS Department is [www.standford.cs.edu](http://www.standford.cs.edu)

Than, the projects’ URL might be:

<ftp://www.standford.cs.edu/ftp/pub/freebies/newprog.c>