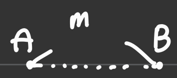
Homework 1

CH1



package size : L bits

rate : R bps

propagation speed : s m/s

packet Transmission delay = $\frac{L\text{(bits)}}{R\text{(bits/sec)}}$

End-end delay = 2L/R

P6. (a) $d_{prop} = \frac{m}{s}$ (s)

(b) $d_{trans} = \frac{L}{R}$ (s)

(c) $d_{end\text{-}to\text{-}end} = \left(\frac{m}{s} + \frac{L}{R}\right)$ (s)

(d) It's leaving Host A

(e) First bit still hasn't reach Host B.

(f) First bit has reached Host B.

(g) $m = \frac{L}{R} s = \frac{120}{56 \times 10^3} (2.5 \times 10^8)$

$= 536$ km #

P8. 10Mbps

200kbps

transmit 10% / time

(a) circuit switching

$\frac{10M}{200k} = 50$ #

(b) packet switching

$p = 10\% = 0.1$ #

(c) 120 users

$C^{120}_{n} p^{n} (1-p)^{120-n}$ #

(d) $P(X \geq 51) = 1 - P(X \leq 50)$

$= 1 - \sum_{i=0}^{50} P(X_i)$

$= 1 - \sum_{i=0}^{50} C^{120}_{n} \cdot (0.1)^{n} (0.9)^{120-n}$

$\approx 1 - 1$

$= 1$ #

P13. (a) N packets arrive

length : L

transmission rate : R

1^{st} packet : 0

2^{nd} packet : $\frac{L}{R}$

3^{rd} packet : $2 \cdot \frac{L}{R}$

$\rightarrow n^{th}$ packet : $(n-1) \cdot \frac{L}{R}$

$$\Rightarrow \frac{\sum_{1}^{n} (n-1) \frac{L}{R}}{n} = \frac{L}{nR} \sum_{1}^{n} (n-1)$$

$$= \frac{L}{nR} \sum_{0}^{n-1} n$$

$$= \frac{L}{\cancel{n}R} \cdot \frac{\cancel{n}(n-1)}{2}$$

$$= \frac{(n-1)L}{2R} \quad \#$$

(b) N packets arrive / $\frac{LN}{R}$ sec

$(N-1)\frac{L}{2R}$ #

To transmit N packets → takes $\frac{LN}{R}$ sec

∴ every time a new bench arrives the queue is empty

∴ the average delay = each time's delay

P14. traffic intensity : $I = \frac{La}{R}$

queuing delay : $\frac{IL}{R(1-I)}$

(a) Total delay = queuing + transmission delay

$$= \frac{IL}{R(1-I)} + \frac{L}{R}$$

$$= \frac{L}{R}\left(\frac{1}{1-I}\right) \text{ sec } \#$$

(b) assume transmission delay $x = \frac{L}{R}$

$\Rightarrow I = \frac{La}{R} = ax$

∴ Total delay $= \frac{x}{1-xa}$ #

P18. (a) Assume three trails of the round-trip delay are:

$D_1 = 1.03$

$D_2 = 0.48$ (msec)

$D_3 = 0.45$

① average: $\frac{1.03 + 0.48 + 0.45}{3} = 0.65$ (msec)

② standrad deviation: $\sigma = \sqrt{\frac{1}{3}(1.03-0.65)^2 + (0.48-0.65)^2 + (0.45-0.65)^2}$

$= \sqrt{0.0711}$

$= 0.267$ (msec) #

(b) ① the number of routers: 9 #

② It might be changed at some period of time.

(c) The largest delays occur → 7 #

(d) intra-continent: use to make it faster to reach to the DNS #

inter-continent: use to the server that is essential for the user #

CH2

P4. (a) Document request: http://gaia.cs.umass.edu/cs453/index.html

The Host: field indicates the server's name

/cs453/index.html indicates the file name #

(b) verison 1.1 #

(c) persistent connection # (Keep-Alive)

(d) need more information #

(e) ① Mozilla / 5.0.

② The browser type information is needed by the server to send different versions of the same object to different types of browsers #

P6 (a) Persistent connections are discussed in section 8 of RFC 2616
Sections 8.1.2 and 8.1.2.1 of the RFC indicate that either the client or the server can indicate to the other that is going to close the persistent connection. It does so by including the connection-token "close" in the Connection-header field of http request / reply. #

(b) HTTP doesn't provide any encryption services. #

(c) No #

(d) Yes. Because from RFC 2616 it said that "A client might have started to send a new request at the same time that the server has decided to close the "idle" connection. From the sever's point of view, the connection is being closed while it was idle, but from the client's point of view, a requests is in progress. #