# Computer Networks

# Assignment-01

By:-

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## Problem:01

$d_{end\ to\ end} = d_{proc} + d_{trans} + d_{prop}$

packet size $= 1200 + (1169 \% 25) = 1219$ bytes $= 9752$ bits

prop speed $= s_1 = s_2 = s_3 = 2.5 \times 10^8$ m/s

transmission rate $= r_1 = r_2 = r_3 = 2$ Mbps $= 2 \times 10^6$ bps

$d_{proc} = 3 \times 10^{-3}$ s

$d_1 = 5000$ km $\qquad d_2 = 4000$ km $\qquad d_3 = 1000$ km

$$d_{trans} = \frac{L}{R_1} + \frac{L}{R_2} + \frac{L}{R_3} = 3 \times \frac{9752}{2\times10^6} = 3 \times 0.004876 = 0.014628$$

$$d_{prop} = \frac{L_1}{speed} + \frac{L_2}{speed} + \frac{L_3}{speed} = \frac{5\times10^6}{2.5\times10^8} + \frac{4\times10^6}{2.5\times10^8} + \frac{1\times10^6}{2.5\times10^8}$$

$$= 0.02 + 0.016 + 0.004$$

$d_{prop} = 0.04$

$d_{proc} = 3\times10^{-3} \times 2 = 6 \times 10^{-3}$

$$d_{endtoend} = 6\times10^{-3} + 0.014628 + 0.04$$
$$= 0.0606285$$
$$= 60.628 \text{ ms}$$

## Problem:02

(a) A circuit switched network would be well suited to the application, because the application involves long sessions with predictable smooth bandwidth requirements. Since the transmission rate is known and not bursty, bandwidth can be reserved for each application session without significant waste. In addition, the overhead costs of setting up and tearing down connections are amortized over the lengthy duration of a typical application session.

(b) In the worst case, all the applications simultaneously transmit over one or more network links. However, since each link has sufficient bandwidth to handle the sum of all of the application's data rates, no congestion (very little queuing) will occur. Given such generous link capacities, the network does not need congestion control mechanisms.

## Problem: 03

length = 30m

transmission rate = 200 bits/sec

$\text{Packet}_{(data)} = 100{,}000$ bits

$\text{Packet}_{(control)} = 300$ bits

Downloaded obj size = 150,000 bits

no of obj = 10

Bandwidth = 200/10 = 20 bits/sec

**(a) for non-persistent:**

$$= \left[\frac{300}{200} + \frac{300}{200} + \frac{300}{200} + \frac{100{,}000}{200} + 4 \times T_{prop}\right] + \left[\frac{300}{20} + \frac{300}{20} + \frac{300}{20} + \frac{100{,}000}{20} + 4 \times T_{prop}\right]$$

$$= \frac{9}{2} + 500 + 45 + 5000 + 8 \times T_{prop}$$

$$= 5549.5 + 8\, T_{prop} \text{ sec}$$

**(b) for persistent:**

$$= \left[\left(\frac{300}{200} \times 3\right) + \frac{100{,}000}{200} + 4T_{prop}\right] + 10\left[\frac{300}{200} + \frac{100{,}000}{200} + 2T_{prop}\right]$$

$$= 4.5 + 500 + 5015 + 24T_{prop}$$

$$= 1079.5 + 24T_{prop} \text{ sec}$$

where Tp is very small

There is a significant decrease in delay with persistent HTTP.

## Problem: 04

no. of requests = 12

Object size = 850,000 bits = L

access link rate = 150,00000 bits/sec = R

(a) $T_{prop} = \frac{L}{R} = \frac{850,000}{15000000} = 0.0567$ sec

average link intensity = no of requests $\times T_{prop}$

$= 12 \times 0.0567$ sec

$= 0.6804$ sec

average access delay $= \frac{T_{prop}}{1 - \text{avg link intensity}}$

$= \frac{0.0567}{1 - 0.6804}$

$= 0.1774$ sec

avg response time $= 0.1774 + 3 = 3.1774$ sec

(b) avg access delay $= \frac{0.0567}{1 - (0.4)(0.6804)} = 0.0779$ sec

if there is a cache hit (60%), response time is 0.

Incase of miss (40%), average response time is:

$0.078 + 3 = 3.078$ sec

avg response time $= (0.6 \times 0) + (3.078 \times 0.4) = 1.2312$ sec.

Using cache, response time reduces from 3.1774 to 1.2312s