Math example:

Given,

Access Link Rate (R) = 1.54 mbps

RTT = 2 sec

Web object size (S) = 100 Kbits

Average request Rate (λ) = 15/sec

Average Data rate to Browser = 1.50 mbps

Transmission time = $\frac{\text{Web object size}}{\text{Access Link Rate}} = \frac{100}{1.54} =$

$= \frac{100 \times 10^3}{1.54 \times 10^6}$

$= 0.065$ sec

$= 65$ ms

Total time (without caching) = RTT + Transmission time

$= 2$ sec $+ 0.065$ sec

$= 2.065$ sec

For 15 request, total time, (15×2.065) sec

$= 30.975$ sec.

With cache:

Time to retrive $= \frac{\text{Web object size}}{\text{Date Rate to browser}}$

$= \frac{100 \text{ kbits}}{1.50 \text{ Mbps}} = \frac{100 \times 10^3}{1.50 \times 10^6}$

$= 0.067$ sec

$= 67$ ms

For 14 Cach request, 14×0.067 sec

$= 0.938$ sec

Total time = First Request + 14 cash Request

$= 2.065 + 0.938$

$= 3.003$ sec

First Request (without cach-)
$= 2.065$ sec

∴ without Cache — 30.975 sec

∴ with cach - 3.003 sec.

Lan Utilization :

$$U_{LAN} = \frac{\text{Date rate}}{\text{Link Capacity}} = \frac{\text{Average Request Rate} \times \text{Web object size}}{\text{Link capacity}}$$

$$= \frac{15 \times 100 \times 10^3}{1.54}$$

$$= \frac{1.5 \text{ mbps}}{1.54}$$

$$= 0.0974$$

Access Link Utilization:

$$U_{AccessLink} = \frac{\text{Date Rate from Request}}{\text{Access Link Rate}}$$

$$= \frac{15 \times 100 \times 10^3}{1.54}$$

$$= \frac{1.5 \text{ mbps}}{1.54}$$

$$= 0.974$$

End to End delay:

$$D = RTT + \text{Transmission delay}$$

$$= RTT + \frac{\text{web object size}}{\text{Access Link Rate}}$$

$$= 2 + \frac{100 \text{ kbits}}{1.54 \text{ mbps}}$$

$$= 2 + 0.065 \text{ sec}$$

$$= 2.065 \text{ sec.}$$