CSE421 - Computer Networks - SFQ
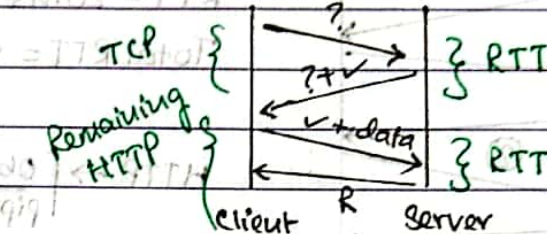
Lecture 03 - HTTP Math

HTTP - Persistent → keeps the connection open for multiple data (open one time)

   Non-persistent → n objects n times you have to open connection for data exchange.
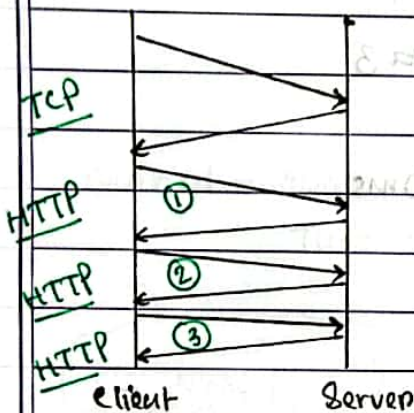
* Round Trip Time (RTT)

* Objects - 3

   n objects → n RTTs   Remaining HTTP

Persistent Connection -

   Given RTT = 20ms. find total RTT.

   Total RTT = 4×20 = 80ms

   Suppose, TCP RTT = 20ms

       HTTP RTT = 40ms

   Total RTT = 20 + 3(40) = 140ms

Ex.
Show me the google webpage

data = HTTP Request

R = Response

HTTP Req = 40ms
HTTP RTT = 80ms.
Total RTT = 20 + 3(80)
= 260ms.

* File Transfer Time (FTT) - time from sending to receiving the file.

   n objects → n FTTs   Object download = 20ms

       FTT = 3×20 = 60ms

* HTTP Response time. = total RTT + FTT = 80 + 60 = 140ms.

Non-Persistent → one object then TCP then second object and so on.
   Connection   HTTP   HTTP

n objects → n TCP

Object = 3 RTT = 3 ← TCP RTT = 20ms

3 TCP and 3 HTTP   HTTP RTT = 40ms

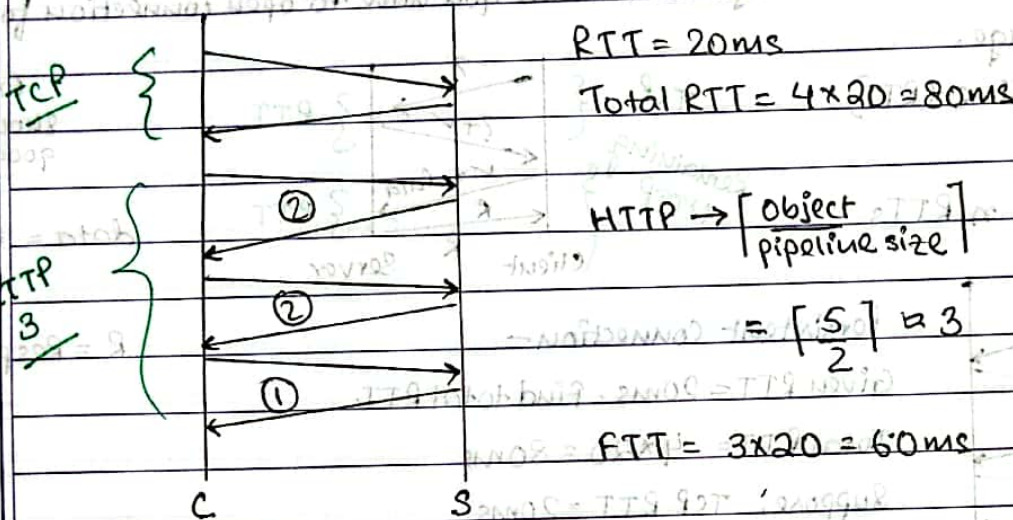Total RTT = 3×20×2   Total RTT = 3×20 + 3×40

       = 120ms   = 60 + 120 = 180ms.

Persistent (Pipelining) —

Pipeline size = 2   (you can send two objects at a time)

Objects = 5

RTT = 20ms

Total RTT = 4×20 = 80ms

$HTTP \rightarrow \left[\dfrac{object}{pipeline\ size}\right]$

$= \left[\dfrac{5}{2}\right] = 3$

FTT = 3×20 = 60ms

C   S

Utilization —

* Access Utilization $= \dfrac{15 \times 1}{15} \times 100\% = 100\%$

* LAN Utilization $= \dfrac{15 \times 1}{100} \times 100\% = 15\%$

Access link = 15 Mbps

LAN link = 100 Mbps

Object/File size = 15 MB

Object/rate = 1 obj.s⁻¹

Increasing Access link is difficult (submarine + geographical)

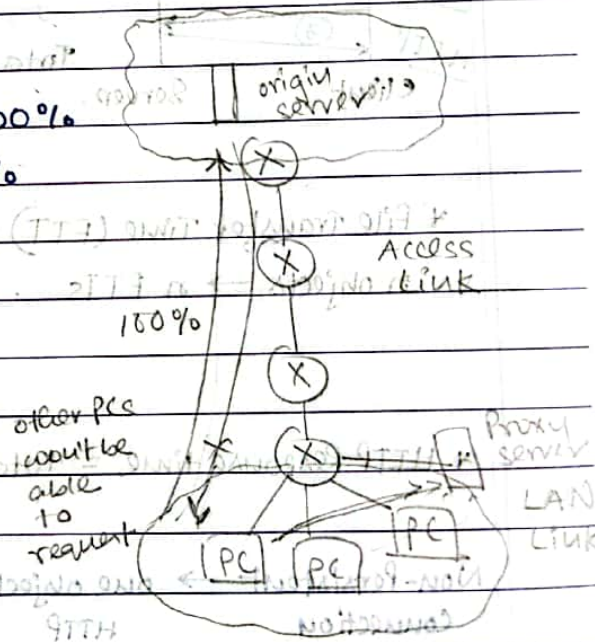Solution – Proxy Server (LAN) – easy to increase

what if LAN utilization = 100%?

↳ Soln – Load (traffic intensity) Balancing → redirect to another server

origin server

Access link

100%

other PCs wou't be able to request

Proxy server

LAN link

7 Megabits → Mega

Delay

* Access Delay (origin thek tah the delay)

* LAN Delay   (proxy theke anhle delay)

* Internet Delay   (major delay)

LAN Hit Rate = 40% — goes to proxy & 60% to origin

Origin/Access Hit Rate = 60% — goes to origin & 40% to LAN

Hit Rate — by default LAN

Access Delay = 20ms

LAN Delay = 5ms

Internet Delay = 100ms

Average Delay = $\underset{\text{LAN}}{5 \times 0.4} + \underset{\substack{\text{Access + Internet} \\ \text{(outside LAN)}}}{(20+100) \times 0.6}$

Quiz 01 — chapter 02 — HTTP

Tuesday (06-02-2024)