Numerical on Performance Parameters - Week 1

Q1. Suppose a client machine A is communicating with a data center B located 8000 km away from A. How long will it take for a response sent by server to reach client A?(Assume speed of light in cable is 2e8 m/s).

(by default 3x10^8)

—-------request—->>---------   2e8 = 2x10^8

A   B

client —-<<----- response—-------- server

8000km

Speed = Distance / time   time=distance/speed

Latency= round trip time +delays

= request time+response time+delays

= (8000 x 1000/2 x 10^8)+(8000x 1000/2 x 10^8)+0

= 2x8000x1000/2x10^8 (m/m/s) s

= .08s 1 sec= 1000ms

= 80 ms

Q2 Suppose a client machine C is communicating with a data center D located 15000 km away from C. Assume that the TCP connection has been established and is kept alive. If each new request can be sent only after receiving an acknowledgement from D for the previous request, then what is the maximum number of successful requests that can be sent from C to D in one second? (Assume speed of light in cable is 2e8 m/s).

```
     —-------request—->>---------                 2e8 = 2x10^8
C                                   D
     —-<<----- response—-------
             15000km
```

RTT= 2x 15000x 1000/2x10^8

= .15 s = 150ms (one request-response cycle)

= 1000/150

= 6.67

1000 = 150+150+150+150+150+150=900 ms 6requests 100ms left

While making 7th request 75ms+ 25ms left

6 successful request

Q3 Consider a client which is located 6000 km from the server makes a request through the cable. Suddenly after the request reaches the server, the cable breaks and the response is now to be sent to the client via air. This change of medium caused an additional delay of 75 ms at the server end. How long will the client have to wait before receiving the response?(speed on cable = 2e8 m/s and in air 3e8 m/s)

—--------request—->>--------- cable   2e8 = 2x10^8 1ms=10

A   B

—-<<----- response—-------- air

6000km

Latency = RTT + delays

= tr+ Tr +delays

= (6000x1000/2x10^8)+(6000x1000/3x10^8)+.075

= .03+.02+.075

= .125s =125ms

Q4. For a network bandwidth of 8Gbps, what should be the size of each request if 5000 such requests are to be sent over the network per second?(use 1KB=1000 Bytes, 1MB=1000KB and so on)

Bits and Bytes

1 Byte =8 bits
1 KB = 1000 Byte
1 MB = 1000 KB = 10^6 Bytes
1 GB = 1000 MB = 10^6 KB = 10^9 Bytes
1 TB = 1000 GB = 10^6 MB = 10^9 KB = 10^12 Bytes

Time conversion
1sec = 1000 milliseconds
1 millisec = 10^-3 s
1 microsecond = 10^-3 millisec = 10^-6 sec
1 nanosecond =10^-3 micros =10^-6 mills= 10^-9 sec

Bandwidth = (no of requests/s) x size of request
8000Mbps = 5000 req/s x S
S= 8000/5000
= 1.6 Mb
= .2 MB (1.6/8 bytes)

Bandwidth> b> bits
Storage, size of request> B> bytes

Q5 A certain video on the web occupies 2 megabytes of memory of the server. If there are 5 million concurrent viewers of that video assuming that each viewer requires an individual connection to the server to view the video, what should be the minimum RAM requirement of the server that can process all the viewers simultaneously?

Solution:

	Instances	
Client	**RAM**	**SERVER**
A	video1	video1 (2 MB)
B	video1	

Arya = 1client x size

Arya , deepam = 2clients x size

Arya, deepam, arjun = 3clients x size

N clients = n x size

RAM Requirement = 5 x 10^6 viewers x 2 MB

= 10 x 10^12

= 10 TB