4. Given: ⇒ RTT between client and server
= 10ms

⇒ web page of size 1KB consisting of 10 objects each of size 100KB.

Assumption: ① RTT is much larger than other delay and response time and would be neglected in further analysis. ② Data of one object can be sent in one TCP connection.

Soln

1 RTT = time required for one TCP connection.

1 RTT = time for web page of 1KB.

a) Non-persistent (For sending every obj re-establish the connection)

Total time
= 1 RTT + 1 RTT + transmit time for objects.

Total time = 2RTT + transmit time for 10 objs.

For every object you require, 2RTT for TCP connection and one for sending the object.

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Transmit time for 10 Objs = 2 (10 RTT) = 20 RTT

Total time = 2 RTT + 20 RTT = 22 RTT
= 22 × 10 ms = 220 ms

b) Persistent Connection

In a persistent connection, TCP connection is not required to be made again and again.

So, the total time = 2 RTT + Transmit time for 10 Obj.

= 2 RTT + (1 * 10) RTT

(only for sending the objs, you need not do TCP connection)

= 12 RTT = 120 ms.

c) Persistent connection with pipelines and dataframes ~~for~~ of 1 KB ~~bo~~ each.

Dataframe = 1 KB, let the transmission time for it be n seconds. (ns/KB)

Total time = 1 RTT + 1 RTT + 1 RTT + (Data size) n

→ for TCP

→ For web page

→ for sending all objs

(100 KB) * 10 + 1 KB

= 1001 KB.

Total time = 3 RTT + (1001 n)

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