ASSIGNMENT-01

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Answer to the Question No. 01

All manufacturers must follow standards so that their devices can communicate properly with others. If each company followed its own ~~devices~~, design, devices would fail to communicate. Following network standards like IEEE, IETF, ISO, etc. guarantees compatibility, scalability, and reliability across products. It also reduces costs and ensures that innovations can be integrated into existing systems without major ~~device~~ redesigns.

Answer to the Question No. 02

HTTP/2.0 website loads faster because it minimizes latency, avoids blocking and uses bandwidth more efficiently. The causes of differences between HTTP/1.1 and HTTP/2.0 are:

1) Multiplexing: HTTP/2.0 allows multiple requests and responses to be sent in parallel over a single TCP-connection. whereas HTTP/1.1 only sends one request at a time per connection.

ii) Header Compression : HTTP/2.0 compresses headers using HPACK, reducing overhead and latency.

iii) Binary Framing : HTTP/2.0 uses a binary format instead of plain text, making communication more efficient.

iv) Server Push : HTTP/2.0 can send resources proactively before the client requests them.

Answer to the Question No.03

Since the local DNS server already has the TLD(.bd) information cached, it does not need to contact the root server. The resolution will start from the TLD(.bd) server. The sequence of events is as follows:

i) The local DNS server sends a query to the TLD(.bd) server asking for the IP of "google.bd".

ii) The TLD server responds with a referral to the Authoritative DNS server for "google.bd".

iii) The local DNS server then sends a query to the "google.bd" DNS server asking for the IP of "gate.google.bd".

iv) The "google.bd" server responds with a referral to the "gate.google.bd" DNS server.

v) The local DNS server finally queries the "gate.google.bd" DNS server for the IP of "www.gate.google.bd".

vi) The "gate.google.bd" server replies with the final IP address.

vii) The local DNS server caches this result and returns the IP to the client PC.

There are 3 query-response pairs between the local DNS and the external servers:
i) Local DNS ⟷ TLD (.bd) server.
ii) Local DNS ⟷ google.bd DNS server
iii) Local DNS ⟷ gate.google.bd DNS server.

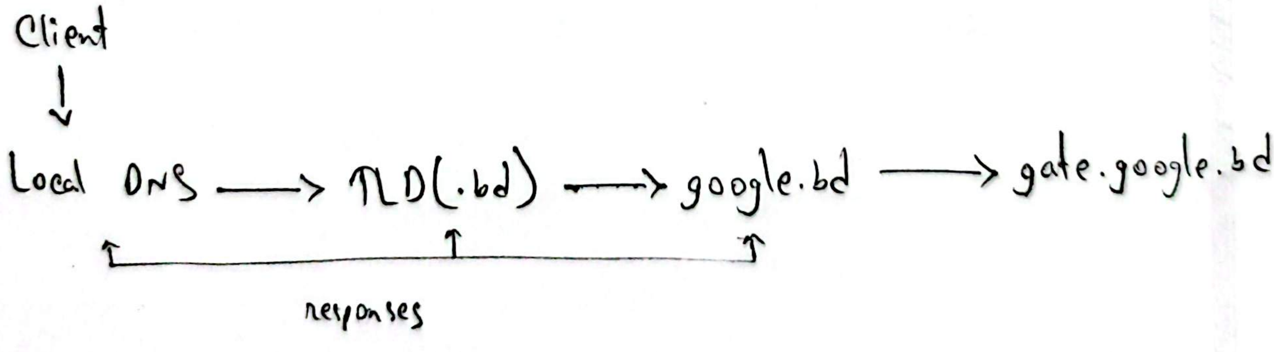

Figure: Diagram of response pairs

Answer to the Question No. 04

Partial downloading is helpful only when :-

i) The user has a slow or unstable internet connection.
ii) The device has limited storage.
iii) The user only wants to preview emails or download headers first before deciding to open documents.

For example, a user on mobile data can view the subject lines and sender information first, then download full emails later.

This is justified because it saves bandwidth, reduces loading time, and gives flexibility to access only the required parts of emails.

Answer to the Question No.05

The suitable Transport layer protocol ~~is~~ in this scenario is TCP (Transmission Control Protocol). The reasons are:

i) Ensures reliable delivery using acknowledgements and retransmissions.

ii) Maintains data integrity and order.

iii) Prevents loss or duplication of packets.

Although TCP has higher overhead, it is ideal when accuracy is more important than speed, like transmitting sensor data that must not be corrupted

Answer to the Question No. 06

This happens during Fast Retransmission in TCP. If the sender receives three duplicate Acknowledgements (ACKs) for the same segment, it assumes that the next segment was lost and retransmits immediately without waiting for the RTO (Retransmission Timeout) to expire. For example, if segment 5 is lost → Receiver sends duplicate ACKs for segment 4 → After 3 duplicates, sender retransmits segment 5 instantly.

Answer to the Question No.07

Given that,

HTTP connection → Persistent

Total objects → 24

Wait time after each response = 5ms = 0.005 s.

One-way transmission delay = 27ms = 0.027 s.

Server Speed = 25 mbps

Total Load Time = 4.345 s.

i) Total RTT = 2 × 0.027 = 0.054 s.

ii) Time spent waiting between objects = (24-1) × 0.005 = 0.115 s.

∴ Effective data transmission time = 4.345 - 0.115 = 4.23 s.

∴ Total bits sent = 25 mbps × 4.23 s

= 105.75 Mb. = 13.21875 mB.

∴ Size of each object = $\frac{13.21875}{24}$ = 0.55 mB

≈ 560 KB.

Answer

Answer to the Question No.08

Given that,

S1 sequence → 1910

S1 acknowledgement → 1532

rwnd (client) → 7000 bytes

rwnd (server) → 9000 bytes

C1 = 144, S1 = 232, S2 = 365, S3 = 421 bytes.

i) S1 seq = 1910, size = 232 → next seq = 1910 + 232 = 2142.

S2 seq = 2142, size = 365 → next seq = 2142 + 365 = 2507

S3 seq = 2507, size = 421 → next seq = 2507 + 421 = 2928

∴ S3 seq = 2507.

S3 Ack = 1532.

ii) Client previously sent C1 = 144 bytes starting from 1532.

So next seq → 1532 + 144 = 1676.

∴ FIN seq = 1676

FIN Ack = 2928.

iii) Client's rwnd (initial) = 7000 bytes. It went by S1 already, so,

Updated rwnd = 7000 + 232

= 7232 bytes.

Answer