



Inspiring Excellence

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Assignment No: 01

Ans. To The Q. No.-01

(a)

The correct serial numbers in
the correct order is given below:

$$1 \rightarrow 5 \rightarrow 2 \rightarrow 3 \rightarrow 6 \rightarrow 4 \rightarrow 7$$

(b)

For the task of three peers

and a 256 MB file split into
8 chunks, the minimum requirement
is that the existing peers collectively
possess all 8 chunks. In other
words, each chunk must be held by
one of the three peers, so the
new peer can download the
entire file

optimistic unchoking is a mechanism in the BitTorrent protocol designed to help peers discover potentially better connections for downloading and to assist new peers in joining the swarm by giving them the chance to receive data without having to upload first.

(c) Given,

$$\text{Server uploads} = 40 \text{ objects/sec}$$

$$\text{Object size} = 4 \text{ bytes}$$

$$\text{Access Link capacity} = 123 \text{ Mbps}$$

$$\text{LAN capacity} = 1023 \text{ Mbps}$$

$$\text{Total Throughput} = 40 \times 4 \\ = 160 \text{ bytes/sec}$$

converting into bits/sec = (160×8) bits/sec

$$= 1280 \text{ bits/sec}$$

$$\text{Access-link utilization, } U_{\text{Access}} = \frac{1280}{123 \times 10^6} \times 100\%$$

$$= 0.00104\%$$

$$\text{LAN utilization, } U_{\text{LAN}} = \frac{1280}{1023 \times 10^6} \times 100\%$$

$$= 0.000125\%$$

Both utilizations are extremely small. Adding a proxy server will help significantly because it would cache frequently accessed objects locally within the LAN and reduce traffic on the access link also.

reduce latency and improve response time for users.

(d)

The HTTP Date header gives the timestamp from the response, which caches use to determine freshness. If the date field were removed, caches and proxies could not correctly compute the age of cached responses. By HTTP spec, a received message that does not have a Date header, must be assigned one by the recipient if the message will be cached.

Without the date, a cache must treat every response as stale.

Thus, deleting Date breaks caching and

freshness checks. A proxy server reduces response time by achieving a cache hit which means it serves the requested data is logically from its storage. It allows the user to receive the response at fast LAN speeds, completely bypassing the high-latency, time consuming trip over the WAN and the slower access link to the origin server.

Ans. To The Q. No. - 02

(a)

on a slow internet connection with mobile phone, it is generally more efficient to use POP3 protocol because it

downloads all the messages in a single batch which reduce repeated data transfer. On the other hand, IMAP constantly syncs with the server which consumes more bandwidth and performs slower under weak network conditions.

(b) Session

The scenario is possible through the use of cookies. The website assigns a unique session ID to the user's browser that has been used via a cookie and stores the cart items on the server associated with that session ID. That's why when I return to that browser,

it returns sends the cookie, then I retrieve the cart items from that session.

(c)

i) RTT required for Phonte's PC = 44×2
 $= 88 \text{ ms}$

(Ans)

ii) Non persistent HTTP requires 2 RTTs per object for TCP handshake and HTTP request/response

$$\text{Total RTT} = 88 + 2(2 \times 89) \times 28$$

$$= 88 + 9968$$

$$= 10056 \text{ ms}$$

(Ans.)

III) Transmission time for object

$$= 19988 - 10056$$

$$= 9932 \text{ ms}$$

$$\text{per object Transmission Time} = \frac{9932}{28}$$

$$= 354.714 \text{ ms}$$

$$= 0.354714 \text{ s}$$

$$\text{Object size} = 24 \text{ MB} = 24 \times 10^6 \text{ Bytes}$$

$$= 192 \times 10^6 \text{ bits}$$

$$\text{Server upload speed, } x = \frac{192 \times 10^6}{0.354714}$$

$$= 541.28 \times 10^6$$

$$= 541 \text{ Mbps}$$

(Ans.)

Ans. To The Q. No.-03

(2)

(a)

A half close technique allows one endpoint to stop sending data while still receiving data from the other end, enabling graceful termination where one party finishes transmission but expects to receive more data.

A full close technique terminates both directions simultaneously. Half close technique is essential for applications like client server interactions where one side signals completion of its transmission without immediately breaking the connection.

(b)

When three duplicate acknowledgements are received for the same segment, TCP triggers fast retransmit. This mechanism retransmits the lost segment without waiting for the retransmission timer to expire, reducing latency compared to time out-based recovery. It works because multiple duplicate ACKs indicate a segment loss rather than network rendering, enabling quicker recovery.

(c)

1) Given,

HTTP request size = 1235 bytes

Data segment size = 889 bytes

Total Data Segments = 18

client ISN = 8484, RWND = 10005 bytes

Server ISN = 9429, RWND = 23080 bytes

$$\text{Sequence Number} = \text{ISN}_{\text{server}} + (4-1) \times 889$$

$$= 9429 + 2667$$

$$= 12096 \quad (\text{Ans.})$$

$$\text{ACK Number} = \text{ISN}_{\text{client}} + 4 \times 235$$

$$= 8484 + 940$$

$$= 9424$$

(Ans.)

ii) Given,

9th data segment got lost.

So client only acknowledges data upto 8th segment

$$\text{ACK Number} = \text{ISN}_{\text{server}} + 8 \times 889$$

$$= 9429 + 7112$$

$$= 16541$$

$$\text{Sequence Number} = \text{ISN}_{\text{client}} + (11-1) \times 235$$

$$= 8484 + 2350$$

$$= 10834$$

$$\text{Sequence Number} = 10834,$$

$$\text{ACK Number} = 16541$$

(Ans.)

(iii) The client has processed the first 5 segments, so segments 6 to 13 are in the buffer (8 segments).

$$\begin{aligned}\text{Buffer Used} &= 8 \times 889 \\ &= 7112 \text{ bytes}\end{aligned}$$

$$\begin{aligned}\text{RWND} &= 10005 - 7112 \\ &= 2893 \text{ bytes}\end{aligned}$$

(Ans.)