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Q1

a)

Source IP: PC0 IP = 0

Destination IP: PC2 IP = 14

Source MAC = C

Destination MAC = D

Ports

Source port = any value > 1023 chosen by PC0
e.g. 49160

Destination port = ~~for~~ for HTTP request = 80

for SMTP (email) = 25 or 587 for submission with TLS

b)

Destination port is a well known server port — such as 80 (HTTP), 25 or 587 (SMTP), 443 (HTTPS)

Source port - ephemeral port.

Q2

-field/value inspect:

The status-like/status code which immediately tells us the class of problem.

Useful headers like Content-Length, Content-Type, server and any caching headers.

HTTP useful methods:

HEAD -> great for quickly checking status code and headers.

OPTIONS -> can be used to check supported methods / CORS preflight info.

Q3

Iterative can be faster when the client or its resolver can contact multiple servers in parallel or use cached referalls, avoiding extra hops and serial waiting the recursive resolver might impose.

Q4

Webmail — A ~~user~~ user accesses webmail via HTTPS. When user sends email, the server uses SMTP

Mail submission from client app - Email client might use HTTPS to reach a web API for sending. But standard mail transfer between servers uses ~~HTTP~~ SMTP.

Q5

1. sender transmits the segment and starts the retransmission timer.

2. If segment lost, no ACK comes back, Sender waits until the RTO expires.

3. When RTO expires, the sender retransmits the segment. Applies congestion control. RTO is increased for subsequent timeouts until an Ack is recieved.

4. If reciever never saw original segment, once it recieves retransmission it will accept it. and send ACK. But if reciever had recieved later segments out of order, it sends duplicate Acks.

5. After senden recieves Ack is resumes sending, adjusts RTT/ RTO estimations and increases cwnd.

Q6

IP = 175. 172. 122. 75.

Subnet Mask = 255. 255. 128. 0

∴ The mask is (1+1) = 17 bits.

· Network address = 175.172.0.0 /17.

Broadcast Address = 175. 172. 127. 255.

Prefix length = /17

Q7

Total RTT = 480 ms.

One-way small packet = 15 ms

∴ RTT = 2 × 15 = 30 ms.

Each obj size = 10 MB.

a) If not persistant HTTP is used, each obj requires new TCP.

Per obj cost = 2 RTT = 60 ms.

No. of obj = 480 / 60 = 8 obj.

b) If web server speed is 80 Mbps.

10 MB = 10 × 8 = 80 Mbit.

∴ Transmission time = 80 Mbit / 80 Mbps

= 1 sec = 1000 ms.

Q8

a)

S1 seq = 2024, length 350

→ next = 2024 + 350 = 2374.

S2 seq = 2374, length 127,

→ next = 2374 + 127 = 2501.

S3 seq = 2501, length 412,

→ next = 2501 + 412 = 2913.

S4 then starts at seq = 2913 and carries 387 bytes.

S4, seq = 2913.

Ack = 5044 + 250 = 5294.

b) Ack-2

$= 2024 + (350 + 127 + 412 + 387)$

$= 3300$.

c) Cumulative Ack -> unchanged.

So Ack = 3300.