

Q27

2-way handshake means no response from the server. So the original host know nothing about the connection is over or not over.

4-way handshake means more resources are wasted.

Q28

UDP can be used in less overhead, faster processing, control over timing, lower latency, no need for lossless data transmission conditions.

Application: video streaming, gaming

Q29

W=1, send 1 packet

After 1 RTT -> W=2, send 2 packets

After 2 RTT -> W=2, send 4 packets

After 3 RTT -> W=2, send 3 packets

After 2 RTTs the TCP flow sends  $1+2+4=7$  packets. After the third RTT, the TCP's `cwnd` becomes 8. As a result, the TCP will send the remaining 3 packets. Thus TCP needs 3 RTTs to send 10 packets by using slow-start.

$1+2^1 + 2^2 + \dots 2^{(m-1)} < k \leq 1 + 2^1 + 2^2 + \dots 2^m$ ,  
 $(2^m) - 1 < k \leq 2^{(m+1)} - 1$ ;  
 $m-1 < \log_2(k+1) - 1 \leq m$ ,  
 $m = \text{ceiling}(\log_2(k+1)-1) = \text{ceiling}(\log_2(k+1)) - 1$   
where  $\text{ceiling}(x)$  denotes the smallest integer that is greater or equal to  $x$ .

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$\text{Ceiling}(\log_2(k+1))-1$

Q30

By allocation, we mean a vector (r1, r2, r3, r4)

(f1, f2, f3, f4) = (3, 4, 5, 6)

Equal:  $r = (2.5, 2.5, 2.5, 2.5)$

Max-min:  $r = (2.5, 2.5, 2.5, 2.5)$

Proportional:  $r = 5/9 * (3, 4, 5, 6)$

(f1, f2, f3, f4) = (1, 2, 3, 6)

Equal:  $r = (2.5, 2.5, 2.5, 2.5)$

Max-min:  $r = (1, 2, 3, 4)$

Proportional:  $r = 5/6 * (1, 2, 3, 6)$

Q31

The Pakistani ISP advertised a more specific route to YouTube. This combined with longest prefix matching caused the outage.