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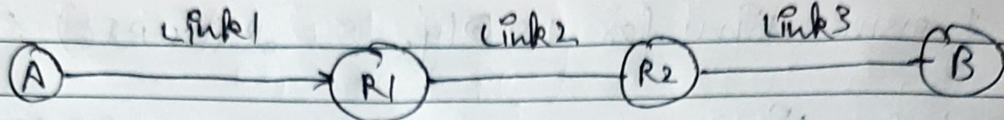

Given: Transmission rates of Link1 = 400Mbps
link2 = 100Mbps
link3 = 200Mbps
Data = 100Kbytes
Each packet has a header of 100bytes.

Case 1 when there is only one packet

$$L = \left((100 \times 10^3) + 100 \right) \times 8 \text{ bits}.$$

$$T_d = \frac{L}{R_{l_1}} + \frac{L}{R_{l_2}} + \frac{L}{R_{l_3}}$$

Note that the propagation delay of link l_2 would be highest. since there is only one packet, no packet would have to wait.

$$T_d = \frac{8 \times 100 \times 1001}{10^6} \left(\frac{1}{400} + \frac{1}{100} + \frac{1}{200} \right)$$

$$= 0.014014$$

$$= \boxed{14.014 \text{ ms.}}$$

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Case 2 when there are 10 packets

Packet size in bytes = $\left(\frac{10^5}{10} + 100\right)8$

$L_{10} = (10^4 + 10^2)8$ bits.

Since $(T_d)_{l_2}$ is much high, there would be queuing delay at R1

Total $Q_d = 0 + \frac{L_{10}}{R_{l_1}} + \frac{2(L_{10})}{R_{l_1}} \cdots \frac{9(L_{10})}{R_{l_1}}$

Total $Q_d = \frac{9(\cancel{10})^5}{2} \frac{L_{10}}{R_{l_1}}$

Total Time = $\frac{L_{10}}{R_{l_1}} + (Q_d)_{Total} + \frac{L_{10}}{R_{l_2}} + \frac{L_{10}}{R_{l_3}}$

$= (1414 \times 10^{-6}) + (9.09 \times 10^{-3})$

$= \boxed{10.504\,ms}$

Case 3 In case of 50 packets.

Packet size = $\left(\frac{10^5}{50} + 100\right) \times 8$

$L_{50} = 16800$ bits

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$$(Qd)_{Total} = 0 + 1.\frac{L_{50}}{R_{l_1}} + 2.\frac{L_{50}}{R_{l_1}} - - - 49\frac{L_{50}}{R_{l_1}}$$

$$= \frac{49 \times 50}{2} \times \frac{L_{50}}{R_{l_1}} = 0.05145s$$

$$Td = L_{50}\left(\frac{1}{R_{l_1}} + \frac{1}{R_{l_2}} + \frac{1}{R_{l_3}}\right)$$

$$= 2.94 \times 10^{-4}$$

$$\text{Total delay} = (51.45 + 0.294) \times 10^{-3}$$

$$= \boxed{51.74ms}$$

Case 4 In case of 100 packets

$$L_{100} = \left(\frac{\cancel{10^5}^{10^3}}{\cancel{10^2}} + 10^2 \right) 8 \text{ bits}.$$

$$(1100)8 = 8800 \text{ bits}.$$

$$T_d = L_{100}\left(\frac{1}{R_{l_1}} + \frac{1}{R_{l_2}} + \frac{1}{R_{l_3}} \right) = 154 \times 10^{-6}$$

$$(Q_d)_{Total} = 0 + 1\frac{L_{100}}{R_{l_1}} + 2\frac{L_{100}}{R_{l_1}} \text{ --- } 99\frac{L_{100}}{R_{l_1}}$$

$$= \frac{99 \times \cancel{100}^{50}}{\cancel{2}} \frac{L_{100}}{R_{l_1}} = 0.1089$$

Total delay $= 0.109054$ s

$= \boxed{109.054 \text{ ms.}}$

Thus the total delay is least for the case of 10 packets.

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