Given, the access link and LAN link speeds are 123 Mbps and 1023 Mbps respectively. Also, the server is capable of uploading 40 objects per second of 4 Mb each. Identify the percentage utilizations of LAN and access link. Comment if adding a proxy server would help.

Given

- Access link = **123 Mbps**
- LAN link = **1023 Mbps**
- Server uploads **40 objects/sec**, each **4 Mb**.

Step 1 — total upload rate required

$$\text{Total} = 40 \times 4\ \text{Mb/s} = 160\ \text{Mbps}$$
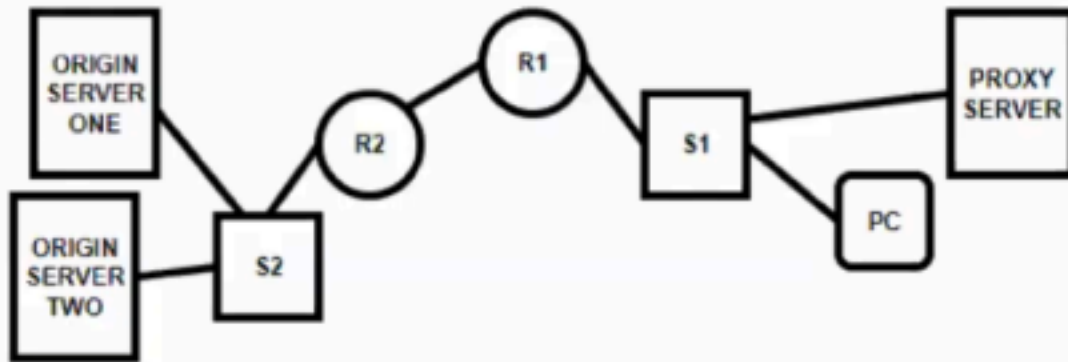
Step 2 — LAN utilization

$$\text{LAN util} = \frac{160}{1023} \times 100\% \approx 15.65\%$$

Step 3 — Access link utilization

$$\text{Access util} = \frac{160}{123} \times 100\% \approx 130.08\%$$

Conclusion / Comment about proxy

- **LAN** is fine (~15.7% utilization).
- **Access link** is **overloaded** (~130%) and will be a bottleneck.
- **Proxy / caching** can help **if many requests are for the same cacheable objects** — it would reduce the number of objects fetched across the access link and lower utilization. If each object is unique per user, caching won't reduce traffic and you'll need to increase access capacity or reduce upload rate.

Given the Access, Internet, and LAN delays of the topology are 67ms, 3.85s, and 33ms respectively. Also, given that 20% of the requests made by PC go to the Origin server ONE while 30% goes to PROXY SERVER. Calculate the total delay for the PC.

Assumptions

1. The remaining 50% of requests (100% − 20% − 30%) go to **Origin Server TWO**, which is located at the same remote site as Origin Server ONE (so its delay is the same as Origin ONE).

2. The given delays are **RTT** delays for each link type:

   ○ **LAN delay** = 33 ms
   ○ **Access delay** = 67 ms

   ○ **Internet delay** = 3.85 s = 3850 ms
   ○ (Access delay + Internet delay)= 3850+67=3917
   ○ Origin server 1+ origin server 2= 70%

Average hit rate = 30%

   ○ 0.7x(3850+67)+ (0.3x33)=2751.8ms = 2.75 sec