Quiz#1

Question 2:

Consider the scenario shown in figure 1, with four different servers connected to four different clients over four three-hop paths. The four pairs share a common middle hop with a transmission capacity of R = 100 Mbps. The four links from the servers to the shared link have a transmission capacity of R_S = 20 Mbps. Each of the four links from the shared middle link to a client has a transmission capacity of R_C = 90 Mbps per second.

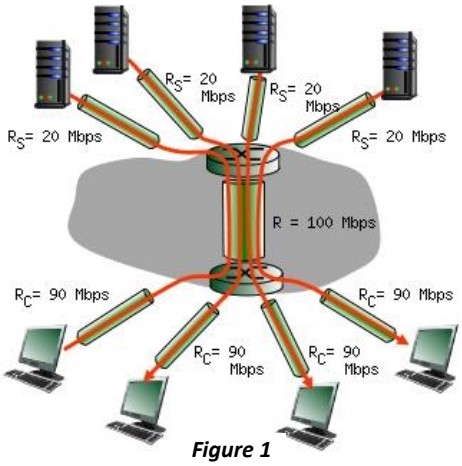

Figure 1

a) What is the maximum achievable end-end throughput (in Mbps) for each of four client-to-server pairs, assuming that the middle link is fair-shared (i.e., divides its transmission rate equally among the four pairs)?
b) Which link is the bottleneck link for each session?
c) Assuming that the senders are sending at the maximum rate possible, what are the link utilizations for the sender links (R_S), client links (R_C), and the middle link (R)?

Answer:

a) The maximum achievable end-end-throughput is 20 Mbps.
b) This is the transmission capacity of the first hop, which is the bottleneck link, since the first-hop transmission capacity of 20 Mbps is less than one quarter of the shared-link transmission capacity (100/4 = 25 Mbps) and less than the third-hop transmission capacity of 90 Mbps.
c) The utilization of sender links is 100% . The utilization of receiver links is 22.22% . The utilization of the middle link is 80% .

Quiestion#2

Justify your answer with 1–2 lines of reasoning.

1. A hospital wants to perform remote robotic surgery across continents. They must choose between a packet switched network and a circuit-switched networks. Q: Should they use packet switching?

2. On a shared Wi-Fi, one user starts downloading a 5 GB file, while another is on a Zoom call. Q: Will the file download affect the video call quality?

1.No.
Packet-switched (public Internet) paths have variable delay, jitter and possible packet loss — remote robotic surgery needs deterministic, tightly bounded latency and ultra-high reliability, so use a dedicated circuit-like connection (leased line/optical circuit or a guaranteed-QoS/MPLS/5G-sliced service).

2.Yes.
A 5 GB download on the same Wi-Fi contends for the shared radio medium and can saturate bandwidth, raising latency/jitter and packet loss that degrades Zoom; mitigate with QoS, rate-limiting, or moving one user to a wired/separate link.