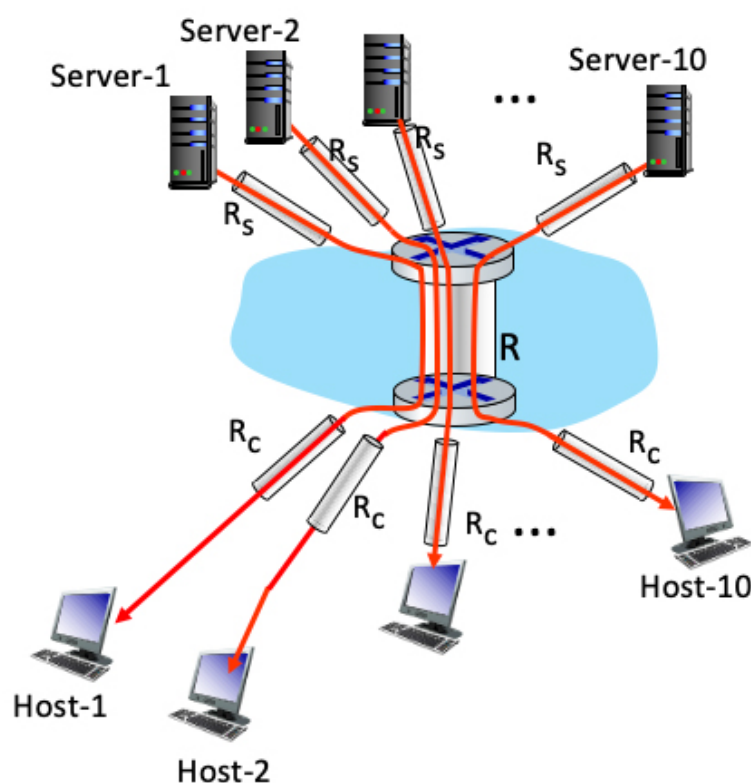


**1.4-06a. Performance: End-to-end delay.** Consider the scenario shown below, with 10 different servers (four shown) connected to 10 different clients over ten three-hop paths. The pairs share a common middle hop with a transmission capacity of  $R = 200$  Mbps. Each link from a server to the shared link has a transmission capacity of  $R_s = 25$  Mbps. Each link from the shared middle link to a client has a transmission capacity of  $R_c = 50$  Mbps.



Now consider the three-hop path from Server-10 to host-10, assuming the values of  $R_s$ ,  $R_c$ , and  $R$  given above. Assume also that a packet is 1000 bits long, and that each link has a propagation delay of 100 microseconds (1 microsec = 0.000001 sec). You can assume that queueing delay and nodal processing delays are zero. What is the total amount of time from when a server starts sending a packet until a host completely receives that packet