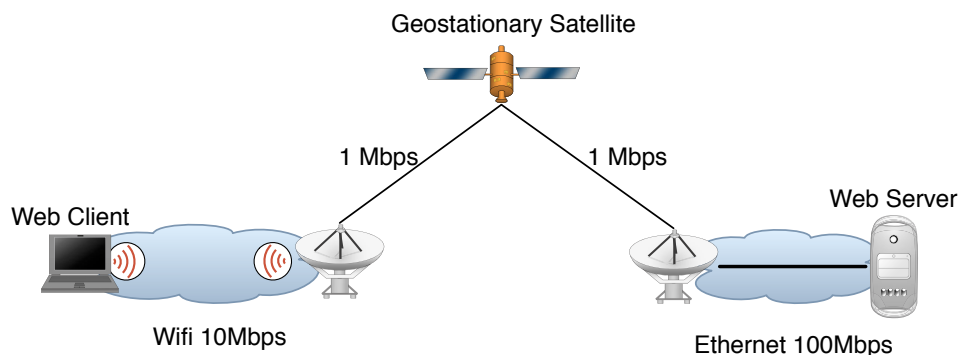


Exercises #2 for Computer Networks

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1. **Network Performance :** Two hosts are connected through 3 types of network : Wifi, Satellite & Ethernet. The Ethernet throughput is 100Mbps, Wifi is 10 Mbps and Satellite 1 Mbps. Routers interconnect the Wifi and Ethernet LAN to the satellite network. The satellite behaves like a store and forward switch (the packet must be completely received before being forwarded)



The user working on the web client downloads a page of 10000 bytes from the web server. We assume that data are directly transmitted on the wire without any additional encapsulation (no overhead). We ignore processing and waiting times and the connection establishment duration.

Let's consider two switching mode : packet switching (the web page is divided into ten 1000-byte packets that are sent one after the other) and message-switching (the web page is sent through a unique 10000-byte message)

- What is the total time of the download (between the click and the instant when the page is downloaded) ?
2. **Packet/Circuit Switching :** Consider sending a packet of F bits over a path of Q links. Each link transmits at R bps. The network is lightly loaded so that there are no queuing delay. Propagation delay is also negligible.
 - Suppose the network is a packet-switched datagram network and a connection-oriented service is used. Suppose each packet has $h \times F$ bits of header where $0 < h < 1$. Assuming t_s setup time, how long does it take to send the packet ?
 - Suppose that the network is a circuit-switched network. Furthermore, suppose that the transmission rate of the circuit between source and destination is $R/24$ bps. Assuming t_s setup time and no bits of header appended to the packet, how long does it take to send the packet ?
 - When is the delay longer for packet switching than for circuit switching assuming $h = 0.5$? Interpret your result.
 3. In chapter one of Kurose's book solve the question R19 and problems P5, P18, P22.