

TUTORIAL 1: Introduction to computer networks

1. *The performance of a client-server system is influenced by two network factors: the bandwidth of the network (how many bits/sec it can transport) and the latency (how many seconds it takes for the first bit to get from the client to the server). Give an example of a network that exhibits high bandwidth and high latency. Then give an example of one with low bandwidth and low latency.*
2. *Besides bandwidth and latency, what other parameter is needed to give a good characterization of the quality of service offered by a network used for digitized voice traffic?*
3. *A factor in the delay of a store-and-forward packet-switching system is how long it takes to store and forward a packet through a switch. If switching time is $10\ \mu\text{sec}$, is this likely to be a major factor in the response of a client-server system where the client is in New York and the server is in California? Assume the propagation speed in copper and fiber to be $2/3$ the speed of light in vacuum.*
4. *What are two reasons for using layered protocols?*
5. *What is the principal difference between connectionless communication and connection-oriented communication?*
6. *Compare the delay in sending an x -bit message over a k -hop path in a circuit-switched network and in a (lightly loaded) packet-switched network. The circuit set up time is s sec, the propagation delay is d sec per hop, the packet size is p bits, and the data rate is b bps. Under what conditions does the packet network have a lower delay?*