

1. (20%) Suppose users share a 1Mbps link. Also suppose each user requires 100 Kbps when transmitting, but each user transmits only 10 percent of the time.
 - a. When circuit switching is used, how many users can be supported?
 - b. For the remainder of this problem, suppose packet switching is used. Find the probability that a given user is transmitting.
 - c. Suppose there are 40 users. Find the probability that at any given time, exactly n users are transmitting simultaneously.
2. (15%) Suppose every participating node in the Gnutella network maintains TCP connections to at least four distinct peers at all times. Support Peer X , which has five TCP connections to other peers, wants to leave.
 - a. Consider the case of a graceful departure, that is, Peer X explicitly closes his application, thereby gracefully closing its five TCP connections. What actions would each of the five formerly connected peers take?
 - b. Suppose that X abruptly disconnects from the Internet without modifying its five neighbors that it is closing the TCP connections. What would happen?
3. (15%) Compare link state and distance vector routing algorithms on aspects of message complexity, speed of convergence, and robustness.
4. (15%) Why Ethernet chooses CSMA/CD as its protocol instead of others. Please compare CSMA/CD with slotted ALOHA, pure ALOHA and CSMA
5. (10%) What is hidden terminal? How to address the hidden-terminal problem in IEEE 802.11?
6. (25%) A worker sequentially works on jobs. Each time a job is completed, a new one is begun. Each job, independently, takes a random amount of time having distribution F to complete. However, independently of this, shocks occur according to a Poisson process with rate λ . Whenever a shock occurs, the worker discontinues working on the present job and starts a new one. In the long run, at what rate are jobs completed?