

Problem 1

In this problem, you will put together much of what you have learned about Internet protocols. Suppose you walk into a room, connect to Ethernet, and want to download a Web page. What are the protocol steps that take place, starting from powering on your PC to getting the Web page? Assume there is nothing in our DNS or browser caches when you power on your PC. Explicitly indicate in your steps how you obtain the IP and MAC addresses of the first-hop router.

Write your solution to Problem 1 in this box

Problem 2

Suppose four active nodes—nodes A, B, C and D—are competing for access to a channel using slotted ALOHA. Assume each node has an infinite number of packets to send. Each node attempts to transmit in each slot with probability p . The first slot is numbered slot 1, the second slot is numbered slot 2, and so on.

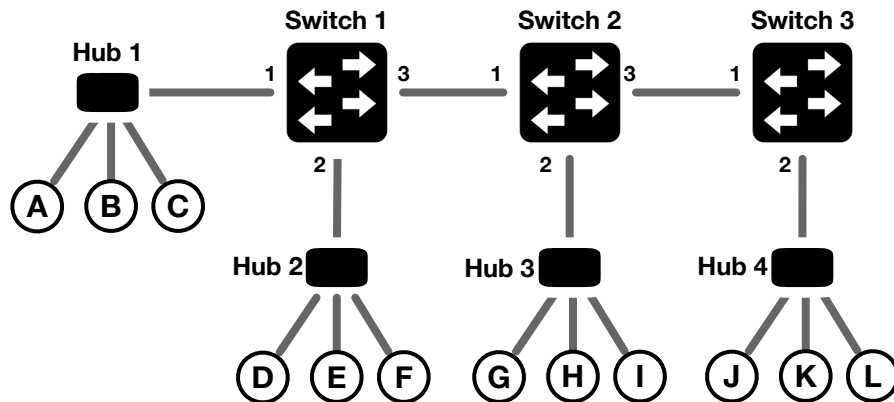
- (a) What is the probability that node A succeeds for the first time in slot 5?
- (b) What is the probability that any node (either A, B,C or D) succeeds in slot 4?

Write your solution to Problem 2 in this box

Problem 3

Consider the following network connected by three switches. The circles in the figure indicate the hosts (From host A to host L). At time=0s, the forwarding tables of all three switches are empty. Assume that all the hosts already know MAC addresses of other hosts, therefore no ARP is required. Also, assume that the TTL values of the forwarding table entries are big enough so that it will not expire in this problem. Suppose, the following seven events happen sequentially:

- Time=1s: Host A sends an IP datagram to Host G
- Time=2s: Host G sends an IP datagram to Host A
- Time=3s: Host D sends an IP datagram to Host L
- Time=4s: Host D sends an IP datagram to Host I
- Time=5s: Host F sends an IP datagram to Host A
- Time=6s: Host K sends an IP datagram to Host G
- Time=7s: Host J sends an IP datagram to Host F



- (a) How many times has each switch broadcasted the received frames? (Considering all seven events above.)

Write your solution to Problem 3 in this box

- (b) List the forwarding table of each switch after the seven events.

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- (c) At time=10s, Host A sends Broadcast IP datagram in the network. How many hosts will receive this broadcast IP datagram excluding the sender?

Write your solution to Problem 3 in this box

Problem 4

Suppose there are two ISPs, providing WiFi access in a particular café, with each ISP operating its own AP and having its own IP address block.

- (a) Further suppose that by accident, each ISP has configured its AP to operate over channel 11. Will the 802.11 protocol completely break down in this situation? Discuss what happens when two stations, each associated with a different ISP, attempt to transmit at the same time.
- (b) Now suppose that one AP operates over Channel 1 and the other over Channel 11. How do your answers change?

Write your solution to Problem 4 in this box

Problem 5

In Mobile IP, what effect will mobility have on end-to-end delays of datagrams between the source and destination?

Write your solution to Problem 5 in this box