| **IS8055556: Data and Computer Communications** | **Recitation 8** |
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| **Semester 2 5785** | **20 May 2025** |
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# Ethernet and Switching

## 1 Learning Switches with Datagram Switching

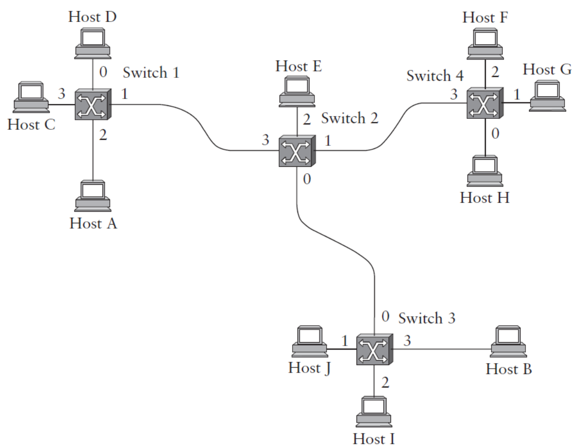


Figure 1: Example Network

Using the example network given above, show how the switches will learn about the locations of the hosts in the network using datagram routing. Assume that the sequence of connections is cumulative; that is, that is the switches learn about each sending in the order shown below and don't lose any information between steps.

(a) Host D sends a packet to host H. Host H responds with an ACK.

(b) Host B sends a packet to host G. Host G responds with an ACK.

(c) Host F sends a packet to host A. Host A responds with an ACK.

(d) Host H sends a packet to host C. Host C responds with an ACK.

(e) Host I sends a packet to host E. Host E responds with an ACK.

(f) Host H sends a packet to host J. Host J responds with an ACK.

## 2 Unweighted Datagram Routing

Consider the example network given in the figure below. Write down the full forwarding tables for Switches 1–4.

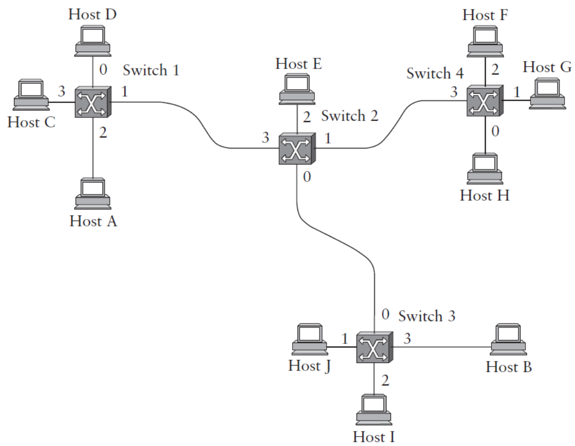


Figure 2: Example Network

## 3 Ethernet Capture

Let A and B be two stations attempting to transmit on an Ethernet. Each has a steady queue of frames ready to send; A's frames will be numbered $A_1$, $A_2$, and so on, and B's similarly. Let $T = 51.2\mu$s be the exponential backoff base unit. Suppose A and B simultaneously attempt to send frame 1, collide, and happen to choose backoff times of $0 \times T$ and $1 \times T$, respectively, meaning A wins the race and transmits $A_1$ while B waits. At the end of this transmission, B will attempt to retransmit $B_1$ while A will attempt to transmit $A_2$. These first attempts will collide, but now A backs off for either $0 \times T$ or $1 \times T$, while B backs off for time equal to one of $0 \times T, \ldots, 3 \times T$.

(a) Give the probability that A wins this second backoff race immediately after this first collision; that is, A's first choice of backoff time $k \times 51.2$ is less than B's.

(b) Suppose A wins this second backoff race. A transmits $A_3$, and when it is finished, A and B collide again as A tries to transmit $A_4$ and B tries once more to transmit $B_1$. Give the probability that A wins this third backoff race immediately after the first collision.

(c) Give a reasonable lower bound for the probability that A wins all the remaining backoff races.

(d) What then happens to the frame $B_1$?

This scenario is known as the *Ethernet capture* effect.