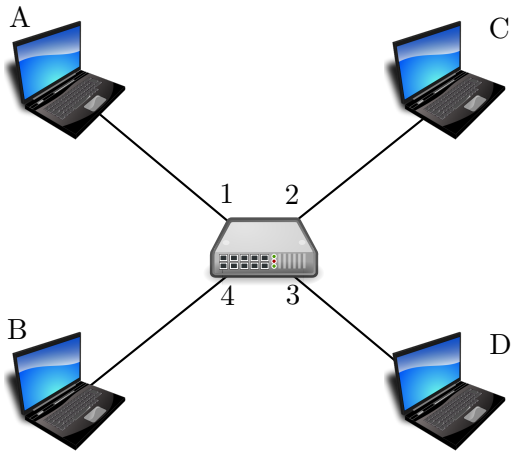
National University of Singapore
School of Computing
CS2105: Introduction to Computer Networks
Semester 1, 2018/2019

Tutorial 10
Local Area Network

These questions will be discussed during the next week's discussion group meetings. Please be prepared to answer these questions during the session in class. Some of the questions are taken from the textbook, so please bring it along for reference.

1. **[Modified from KR, Chapter 5, P6]** In CSMA/CD, after the fifth collision, what is the probability that a node chooses $K = 4$? The result $K = 4$ corresponds to a delay of how many microseconds on a 10 Mbps Ethernet? Use the formula $K = \{0, ..., 2^C - 1\}$ after the C^{th} collision.

2. **[Modified from KR, Chapter 5, P26]** Consider the operation of a learning switch in the context of a network in which 4 nodes, labelled A through D, are star-connected into an Ethernet switch.



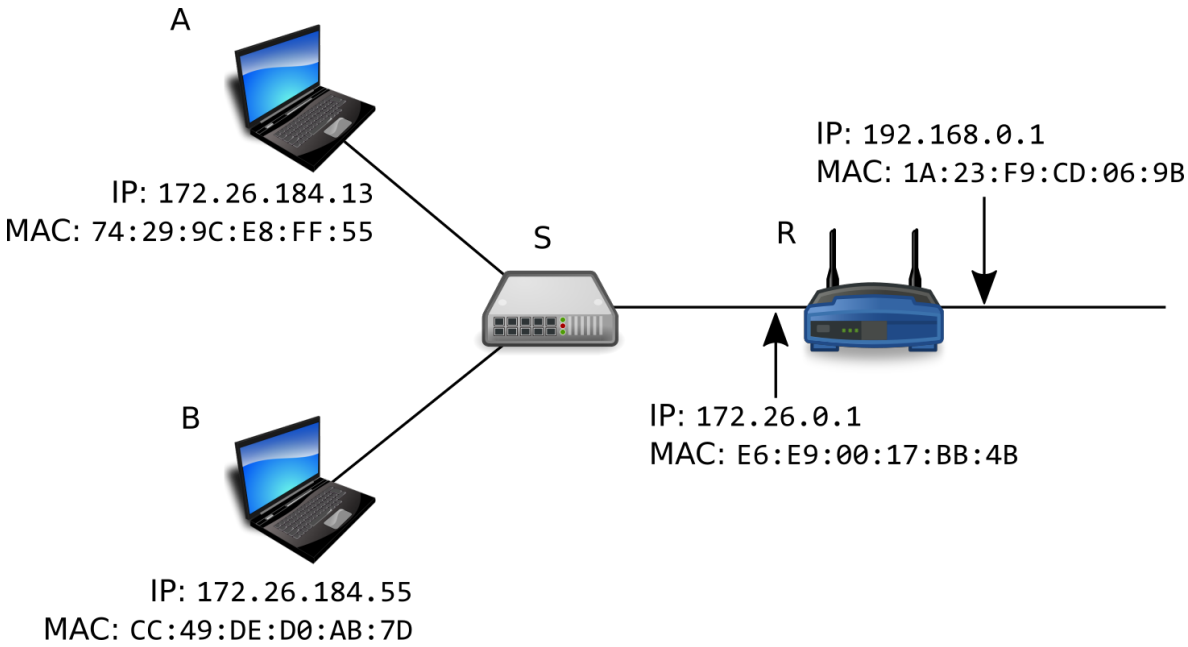
Suppose that the following events happened in sequence,

(a) B sends a frame to D.
(b) D replies with a frame to B.
(c) D sends a frame to A.

The switch table is initially empty. Show the state of the switch table after each of the above events (ignore TTL field). For each event, identify the link(s) on which the transmitted frame will be forwarded, and briefly justify your answers.

Event	Switch table after event	Link(s) frame is fowarded to
B sends a frame to D		
D replies with a frame to B		
D sends a frame to A		

3. Refer to the following figure:



Suppose nodes A, B and R are star-connected into a switch S. A, B and R are aware of the IP addresses of each other.

(a) Consider sending an IP datagram from Host A to Host B. Suppose all of the ARP tables and switch table are up to date. Enumerate all the steps the host and switch take to move the packet from A to B.

(b) Repeat the problem in a), assuming that ARP table in the sending host is empty, but all other tables are up to date.

(c) Repeat the problem in a), assuming that all tables in all nodes are empty.

(d) Suppose A sends an IP datagram to a host in another subnet. All of the ARP tables and switch table are up to date. Enumerate all the steps the host, switch and router take to move the packet to another subnet.

4. **[KR, Chapter 6, P6]** In step 4 of the CSMA/CA protocol (as described in the textbook), a station that successfully transmits a frame begins the CSMA/CA protocol for a second frame at step 2, rather than step 1. That is, it chooses a random backoff value rather than transmit immediately.

   What rationale might the designers of CSMA/CA have had in mind by having such a station not transmit the second frame immediately (if the channel is sensed idle)?