CSC358H5: Principles of Computer Networking — Winter 2025

Worksheet 5: Switched Ethernet

Q0 Knowledge Check (from Week 05 Lecture)

0.a **(True/False)** A learning switch builds its MAC address table by examining the destination MAC addresses of incoming frames.

0.b **(True/False)** In a cut-through switch, the entire Ethernet frame must be received before forwarding begins.

0.c **(True/False)** Store-and-forward switches introduce higher latency than cut-through switches.

0.d **(True/False)** Cut-through switches perform error checking.

0.e **(True/False)** A switch always floods broadcast frames to all ports except the one it was received on.

0.f Which of the following is a primary function of a switch in an Ethernet network?

- ☐ Replacing MAC addresses in frames
- ☐ Forwarding frames based on MAC addresses
- ☐ Assigning IP addresses to connected devices
- ☐ Converting Ethernet frames to wireless signals

0.g What happens when a learning switch receives a frame with a destination MAC address that is NOT in its MAC address table?

Q1

Consider the network topology illustrated in Figure 1. What are the forwarding tables of the switches after occurrence of each of the following events in consecutive order. Assume that the forwarding tables are initially empty.

1.a Host A sends a frame to Host C

S_1's Table		S_2's Table		S_3's Table		S_4's Table	
Destination MAC	Port	Destination MAC	Port	Destination MAC	Port	Destination MAC	Port

1.b Host C sends a frame to Host A

S_1's Table		S_2's Table		S_3's Table		S_4's Table	
Destination MAC	Port	Destination MAC	Port	Destination MAC	Port	Destination MAC	Port

1.c Host D sends a frame to Host C

S_1's Table		S_2's Table		S_3's Table		S_4's Table	
Destination MAC	Port	Destination MAC	Port	Destination MAC	Port	Destination MAC	Port

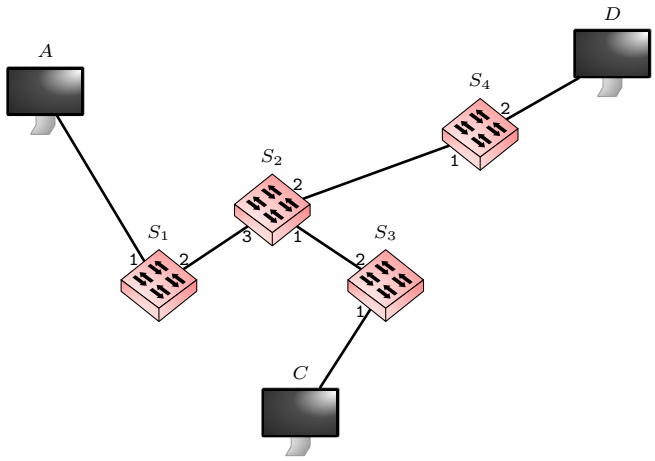

Figure 1: A switched network. Switches' port numbers are specified in the figure.

Q2 **(Spanning Tree Protocol, Spring 2024 - Midterm)** In class, we discussed an algorithm to create a spanning tree for a network of switches. Consider the network topology given in figure 2, where each square node represents a switch and each circle node represents a host. Assume that each switch's ID is equal to its number (*i.e.*, switch $\#k$'s ID is set to k). Answer the following questions for the network topology given below, where cost of each edge is 1.

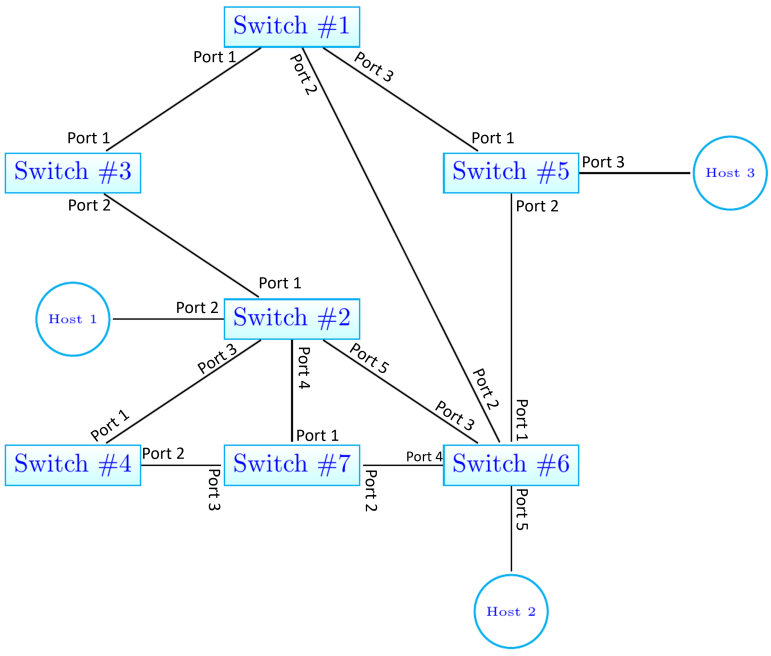

Figure 2: Network of switches

2.a Provide the format of the messages that switches exchange.

2.b **Initialization:** For each node, indicate the initial state of the node, *i.e.*, the first message the node exchanges with its neighbors.

Node	Message
1	
2	
3	
4	
5	
6	
7	

2.c **Step 1:** Assume that all nodes received the messages from their neighbor during the initialization step given in (b). For each node, indicate the next messages that it exchanges with its neighbors.

Node	Message
1	
2	
3	
4	
5	
6	
7	

2.d **Step 2:** Assume that all nodes received the messages from their neighbor during Step 1 in (c). For each node, indicate the next messages that it exchanges with its neighbors.

Node	Message
1	
2	
3	
4	
5	
6	
7	

2.e Assume the spanning tree algorithm has converged. The following events occur sequentially. After each event (i)-(iii) occurs, draw the MAC address tables for Switch #1 and Switch #7. Write your answer in the tables provided on the next page.

2.e.i H1 sends a packet to H2

2.e.ii H3 sends a packet to H2

2.e.iii H2 sends a packet to H3

Switch #1's table after step (i)	
MAC address	Port

Switch #7's table after step (i)	
MAC address	Port

Switch #1's table after step (ii)	
MAC address	Port

Switch #7's table after step (ii)	
MAC address	Port

Switch #1's table after step (iii)	
MAC address	Port

Switch #7's table after step (iii)	
MAC address	Port