CE3005: Computer Networks
CZ3006: Net Centric Computing

Tutorial 2-2:
Network Layer - IP Routing and Routing Protocols

1. Consider three hub-based Ethernets being interconnected by a transparent switch as shown in Figure Q1. Assume that all ARP caches and the switch forwarding table are initially empty.

   Suppose that a user at Station A issues a command *ping 192.168.222.222.* Using a table similar to Table Q1, list the sequence of Ethernet frames that are being sent and received at Station A, the purposes of the frames (e.g. Ping request for 192.168.222.222), and the actions taken by the transparent switch upon receiving the frames.
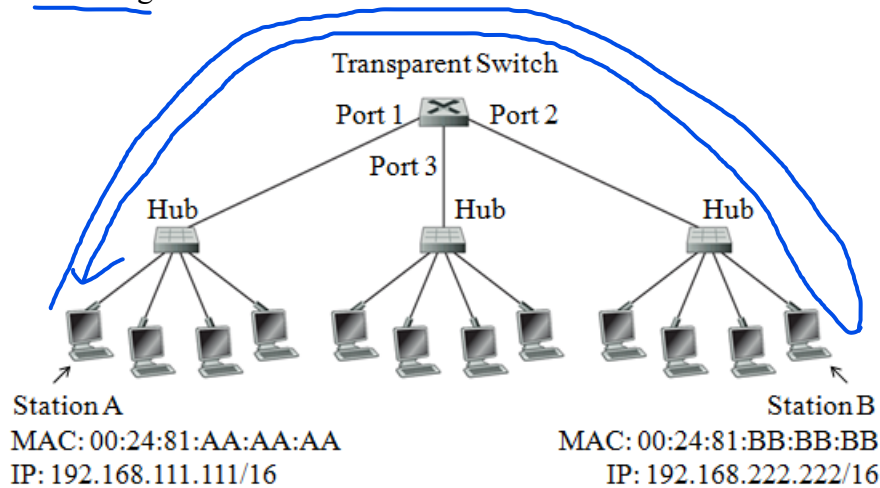

Figure Q1

Table Q1

	MAC address		Purpose of	Actions taken by
Frame	Source	Destination	Frame	the Switch
1.				
2.				
...				

2. Now consider the three hub-based Ethernets being interconnected by a router, which is configured as the default gateway for all stations as shown in Figure Q2. Assume that all ARP caches are initially empty.

   Similarly, suppose that a user at Station A issues a command *ping 192.168.222.222.* Using a table similar to Table Q2, list the sequence of Ethernet frames that are being sent and received at Station A, the purposes of the frames (e.g. Ping request for 192.168.222.222), and the actions taken by the router upon receiving the frames.
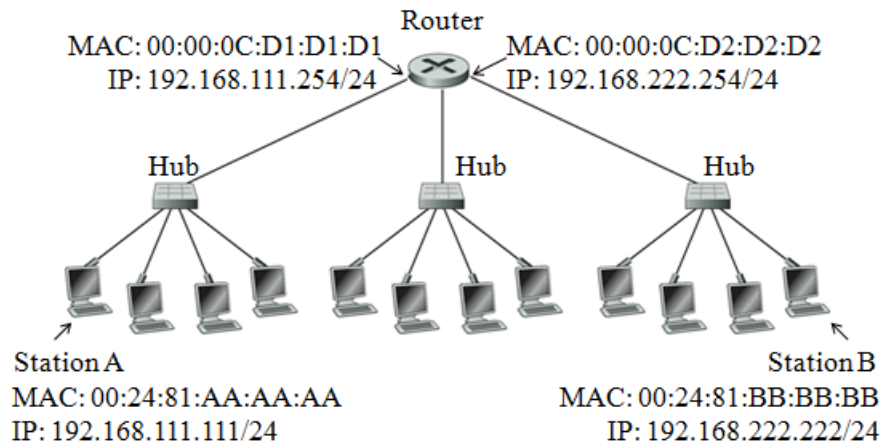
Router

MAC: 00:00:0C:D1:D1:D1
IP: 192.168.111.254/24

MAC: 00:00:0C:D2:D2:D2
IP: 192.168.222.254/24

Hub   Hub   Hub

Station A
MAC: 00:24:81:AA:AA:AA
IP: 192.168.111.111/24

Station B
MAC: 00:24:81:BB:BB:BB
IP: 192.168.222.222/24

Figure Q2

Table Q2

Frame	MAC address		Purpose of Frame	Actions taken by the Router
	Source	Destination		
1.				
2.				
...				

3. The following table shows the results of three trace-routes. Based on the information, draw the network topology. Show clearly the IP addresses of all networks.

From Station A to B	From Station C to A	From Station B to C
155.69.8.10	200.20.80.12	196.19.5.104
10.203.20.10	170.105.10.21	130.21.80.90
130.21.10.30	80.90.10.3	90.80.120.10
196.19.5.5	155.69.8.12	170.105.10.20
		200.20.80.15

4. Using Dijkstra's algorithm, generate the least cost routes to all other nodes from the source node A in the following figure. The integer numbers in the figure represent the link costs.
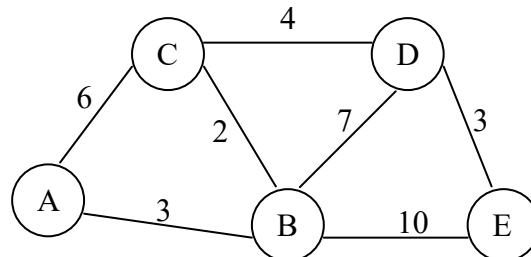
A:0	A:0	A:0	A 0	A 0
B:inf	B:3	B:3	B 3	B 3
C:inf	C:6	C:5	C 5	C 5
D:inf	D:inf	D:10	D 9	D 9
E:inf	E:inf	E:13	E 13	E12