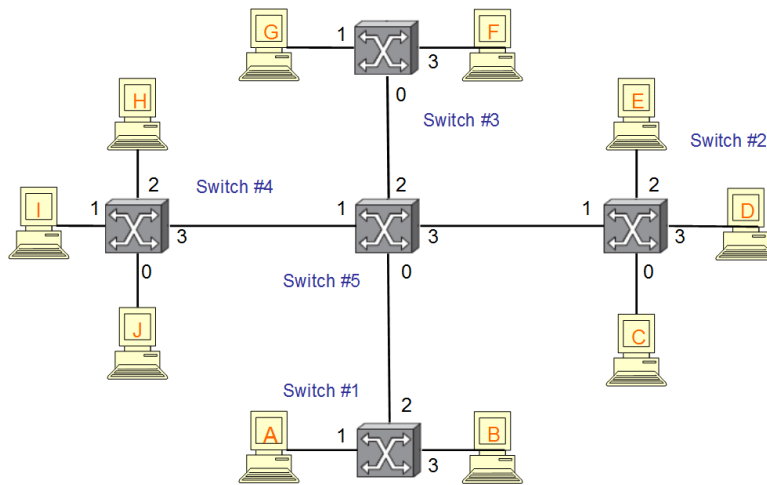


Routing, Subnets, and ARP

1 Virtual Circuit Routing (12 points / 2 points each)

Using the example network shown below, give the virtual circuit tables for all the switches after each of the following connections is established. Assume that the sequence of connections is cumulative; that is, the first connection is still up when the second connection is established, and so on. Also assume that the VCI assignment always picks the lowest unused VCI on each link, starting with 0.



For simplicity, assume that the connection is in only one direction, so A connects to B, the virtual circuit is only the path from A to B (not including a return path from B to A). Also, assume that if a VCI is established on the incoming side of a link that it will not be used again on the same side for a new outgoing VCI. For instance, if there is a single entry in Switch 5's table: (In Port:1, In VCI: 0, Out Port:0, Out VCI: 0) and a new virtual circuit is to be set up on Switch 5 which goes from Switch 2 from Switch 4, the new VCI will be (In Port: 3, In VCI: 0, Out Port: 1, Out VCI: 1) (choosing to number the 5 → 4 connection with 1 since there already was a 4 → 5 connection with number 0).

- (a) Host A connects to host B.
- (b) Host C connects to host G.
- (c) Host E connects to host I.
- (d) Host D connects to host B.
- (e) Host F connects to host J.
- (f) Host H connects to host A.

You may use the following format to express your answer:

Switch 1				Switch 2				Switch 3				Switch 4				Switch 5			
In		Out		In		Out		In		Out		In		Out		In		Out	
P	VCI	P	VCI	P	VCI	P	VCI	P	VCI	P	VCI	P	VCI	P	VCI	P	VCI	P	VCI

2 Bridges (8 points / 2 points each)

Consider hosts X, Y, Z, W and learning bridges B1, B2, B3, with initially empty forwarding tables, as in Figure 1.

- (a) Suppose X sends to Z. Which bridges learn where X is? Does Y's network interface see this packet?
- (b) Suppose Z now sends to X. Which bridges learn where Z is? Does Y's network interface see this packet?
- (c) Suppose Y now sends to X. Which bridges learn where Y is? Does Z's network interface see this packet?
- (d) Finally, suppose Z sends to Y. Which bridges learn where Z is? Does W's network interface see this packet?

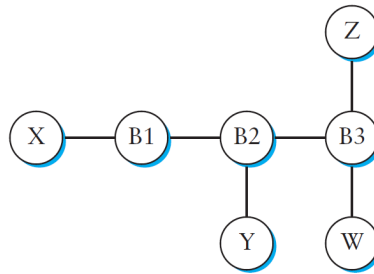


Figure 1: Network Diagram for Question 2

3 Subnets (10 points / 2 points each)

Suppose a router has built up the routing table shown in Table 1. The router can deliver packets directly over interfaces 0 and 1, or it can forward packets to routers R2, R3, or R4. Describe what the router does with a packet addressed to each of the following destinations:

- (a) 128.96.39.10
- (b) 128.96.40.12
- (c) 128.96.40.151
- (d) 192.4.153.17
- (e) 192.4.153.90

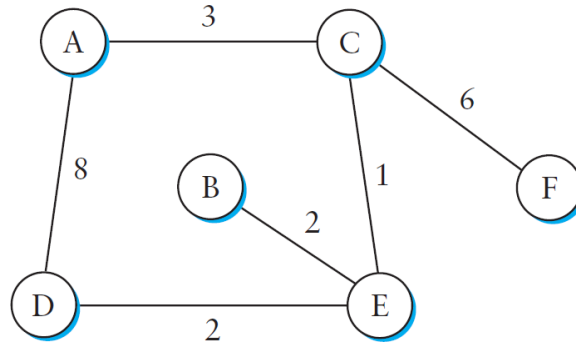
SubnetNumber	SubnetMask	NextHop
192.4.153.0	255.255.255.192	Interface 0
128.96.39.0	255.255.255.128	Interface 1
128.96.39.128	255.255.255.128	R2
128.96.40.0	255.255.255.128	R3
<Default>		R4

Table 1: Routing Table for Question 3

4 ARP (5 points)

Explain the purpose of the Address Resolution Protocol (ARP). Why can't computers on an Ethernet simply be identified using their IP addresses?

5 RIP (9 points / 3 points each)



For the network above, suppose the forwarding tables are all established using RIP (you don't need to show the steps used in deriving them) and then the C-E link fails. Give

- the tables of A, B, D, and F after C and E have reported the news.
- the tables of A and D after their next mutual exchange.
- the table of C after A exchanges with it.

6 Subnetting (20 points)

An organization has a class C network 105.2.1 and wants to form subnets for four departments, with hosts as follows:

- A 12 hosts
- B 102 hosts
- C 60 hosts
- D 58 hosts

There are 232 hosts in all. Give a possible arrangements for subnet masks to make this possible, including subnet network numbers and IP address ranges by filling in the following table:

Name	Subnet Number	Subnet Mask	IP Address Range
A			
B			
C			
D			

What to turn in

Turn in your submission for the above assignment including:

- Names of all students in the group and the total number of hours spent on the assignment
 - If this information is missing I will deduct 5%
- Date of submission
- All work, including calculations and graphs as appropriate

Turn in the above via email to [ise327@gmail](mailto:ise327@gmail.com), in person before the above date (or in my drawer in the Engineering School office, or via fax to 04-665-3661).

Note: Do not send work submissions to my personal email – use the course email ([ise327@gmail](mailto:ise327@gmail.com)).