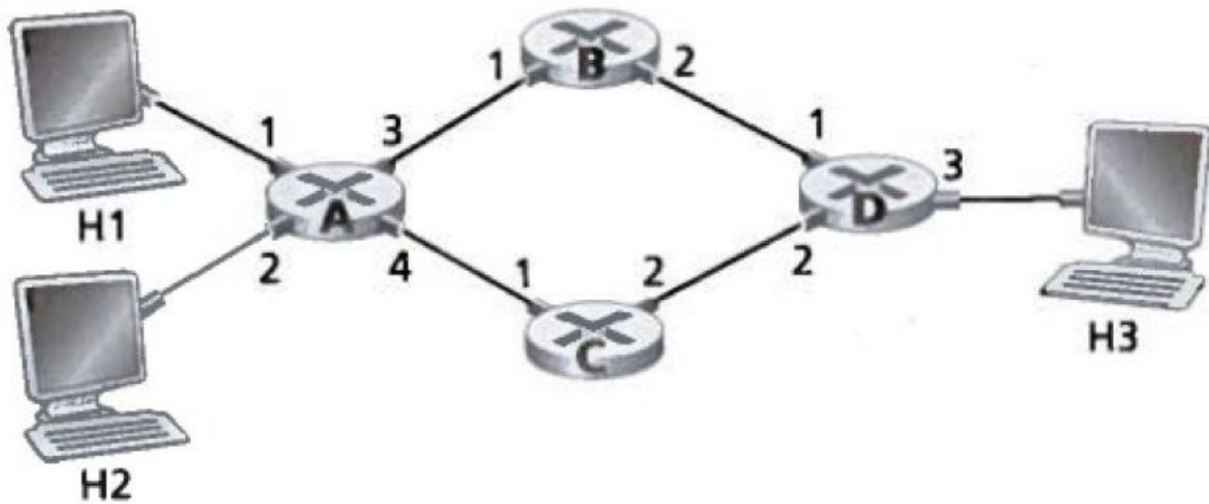


Homework Assignment 3

1. (2pt) Three types of switching fabric are discussed in Section 4.2. List and briefly describe each type. Which, if any, can send multiple packets across the fabric in parallel?
2. (2pt) What is HOL blocking? Does it occur in input ports or output ports?
3. (1pt) What fields in the IP header can be used to ensure that a packet is forwarded through no more than N routers?
4. (1pt) When a large datagram is fragmented into multiple smaller datagrams, where are these smaller datagrams reassembled into a single larger datagram?
5. (2pt) Consider the network below
 - a. Show the forwarding table in router A, such that all traffic destined to host H3 is forwarded through interface 3.
 - b. Can you write down a forwarding table in router A, such that all traffic from H1 destined to host H3 is forwarded through interface 3, while all traffic from H2 destined to host H3 is forwarded through interface 4?



6. (8pt) Consider a datagram network using 32-bit host addresses. Suppose a router has four links, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11100000 00000000 00000000 00000000 through 11100000 00111111 11111111 11111111	0
11100000 01000000 00000000 00000000 through 11100000 01000000 11111111 11111111	1
11100000 01000001 00000000 00000000 through 11100001 01111111 11111111 11111111	2
otherwise	3

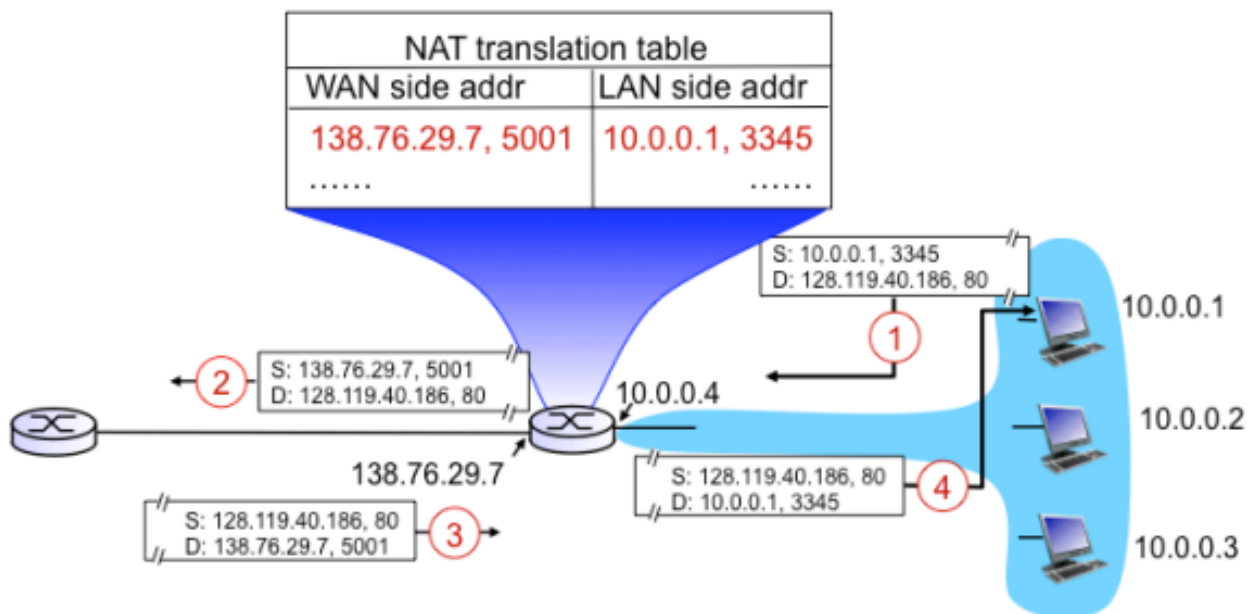
- a. Provide a forwarding table that has five entries, uses longest prefix matching, and forwards packets to the correct link interfaces.
- b. Describe how your forwarding table determines the appropriate link interface for datagrams with destination addresses:

```
11001000 10010001 01010001 01010101
11100001 01000000 11000011 00111100
11100001 10000000 00010001 01110111
```

7. (3pt) Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17/24. Also suppose that Subnet 1 is required to support at least 60 interfaces, Subnet 2 is required to support at least 90 interfaces, and Subnet 3 is to support at least 12 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.
8. (2pt) Consider sending a 2100-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

9. (3pt) Consider the network setup below. Suppose that the ISP instead assigns the router the address 24.34.112.236 and that the network address of the home network is 192.168.1/24.

- Assign addresses to all interfaces in the home network
- Suppose each host has two ongoing TCP connections, all to port 80 at host 128.119.41.85. Provide the six corresponding entries in the NAT translation table.



10. (1pt) What is the difference between a forward table in the destination-based forwarding routers and OpenFlow's flow table that we discussed in Section 4.4?