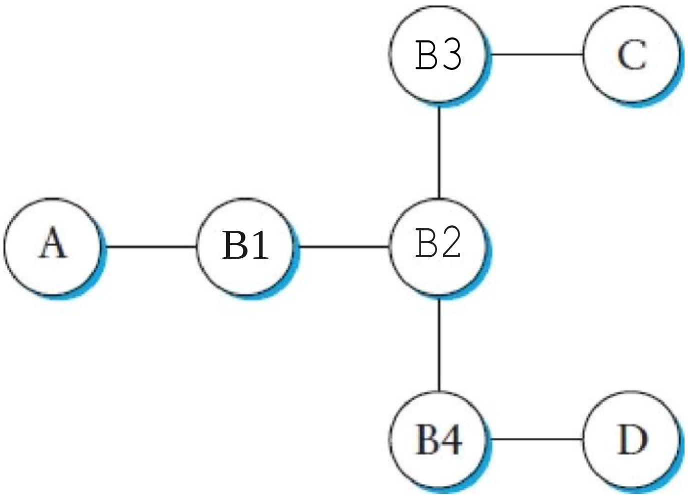
16 As in the previous problem, consider the arrangement of learning switches shown in Figure 3.38. Assuming all are initially empty, give the forwarding tables for each of the switches B1—B4 after the following transmissions:



- D sends to C.
- C sends to D.
- A sends to C.

16. All switches see the packet from D to C. Only B3, B2, and B4 see the packet from C to D. Only B1, B2, and B3 see the packet from A to C.

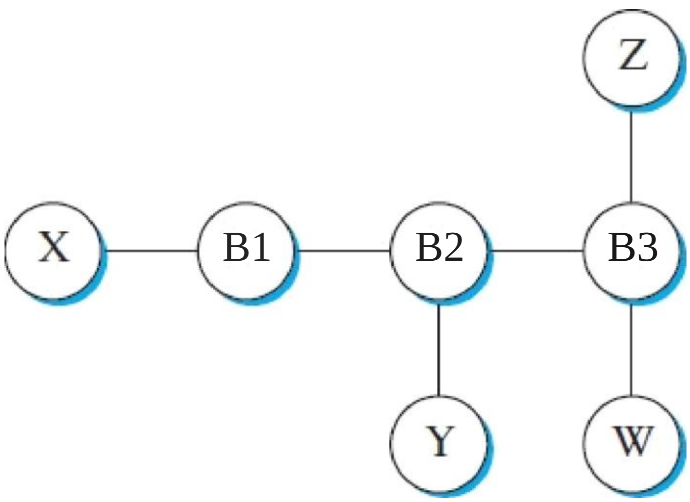
17 Consider hosts X, Y, Z, W and learning switches BI, B2, B3, with initially empty forwarding tables, as in Figure 3.39.

(a) Suppose X sends to Z. Which switches learn where X is? Does Y's network interface see this packet?

(b) Suppose Z now sends to X. Which switches learn where Z is? Does Y's network interface see this packet?

(c) Suppose Y now sends to X. Which switches learn where Y is? Does Z's network interface see this packet?

(d) Finally, suppose W sends to Y. Which switches learn where W is? Does Z's network interface see this packet?



17. (a) When X sends to W the packet is forwarded on all links; all switches learn where X is. Y's network interface would see this packet.

(b) When Z sends to X, all switches already know where X is, so each switch forwards the packet only on the link towards X, that is, B3— B2— BI—•X. Since the packet traverses all switches, all switches learn where Z is. Y's network interface would not see the packet as B2 would only forward it on the Bl link.

(c) When Y sends to X, B2 would forward the packet to Bl, which in turn forwards it to X. Switches B2 and Bl thus learn where Y is. B3 and Z never see the packet.

(d) When W sends to Y, B3 does not know where Y is, and so retransmits on all links; Z's network interface would thus see the packet. When the packet arrives at B2, though, it is retransmitted only to Y (and not to Bl) as B2 does know where Y is from step (c). B3 and B2 now know where W is, but B1 does not learn where W is.

Consider the following network. All devices want to transmit at an "average" rate of R Mbps with equal amount of traffic going to every other node.

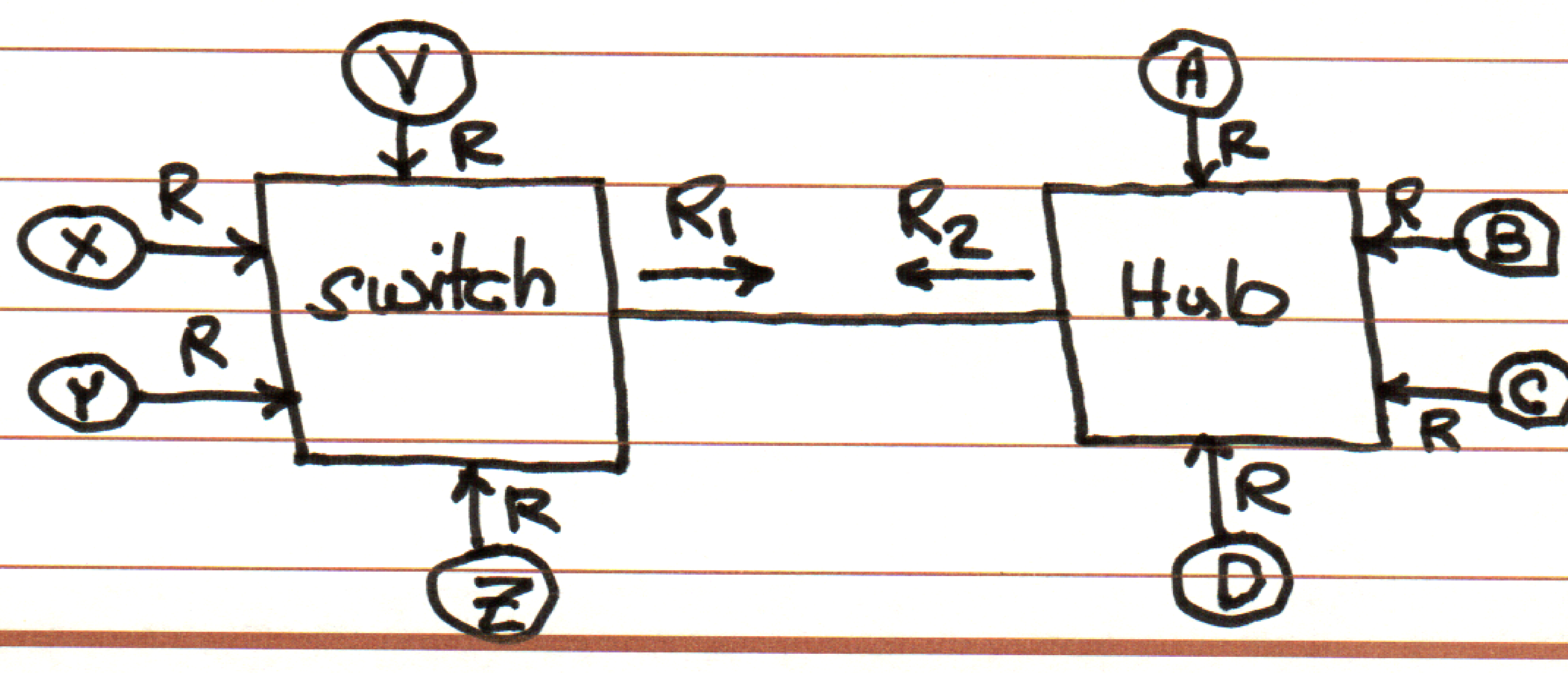
assume all links are HDX at 100Mbps

each Link can only be used in one direction at a time

a) what is the maximum value of R

for switch-hub bottleneck and for hub bottleneck

b) Replace the hub with another switch, what will be the maximum value of R?



Solution:

Since there are 8 nodes and each node is transmitting to every other node

$\Rightarrow$ Each node generate 7 flows of $\frac{R}{7}$ to every other node

Case 1: Switch_Hub Bottleneck

$R_1 + R_2 \leq 100$ Mbps (Half_duplex)

$R_1 = (\frac{1}{7} \times 4) 4R$

there are 4 destinations in hub

4 Transmitters @ the switch

$R_2 = 4R$ (remember the hub just broadcast all traffic.

$\therefore (\frac{16}{7} + 4)R \leq 100$ M

$\Rightarrow \boxed{R \leq 15.9 \text{ Mbps}}$

Case 2 : Hub Bottleneck

Consider the Link connecting the hub to node A . from the perspective of node A,

$$\text{Input Traffic} = R_1 + 3R$$

$$= \left(\frac{16}{7} + 3\right)R$$

$\text{output traffic} = R$ (from A to other nodes)

$$\Rightarrow \left(\frac{16}{7} + 4\right)R \leq 100M$$

$$\Rightarrow \boxed{R \leq 15.9 \text{ Mbps}}$$

b) Replacing the hub by a switch
Switch_to_Switch bottleneck

$$R_1 + R_2 \leq 100M$$

$R_1 = \frac{16}{7}R$, $R_2 = \frac{16}{7}R$ $\Rightarrow \frac{32}{7}R \leq 100$

$$\boxed{R \leq 22 \text{ Mbps}}$$