

Computer Networks

LAN Switches (§4.3.4, §4.8.1-4.8.2, §4.8.4)



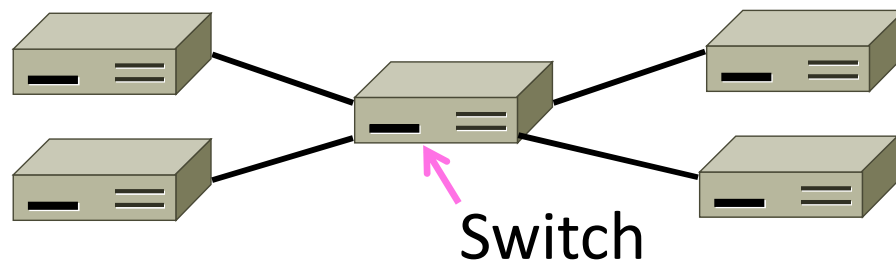
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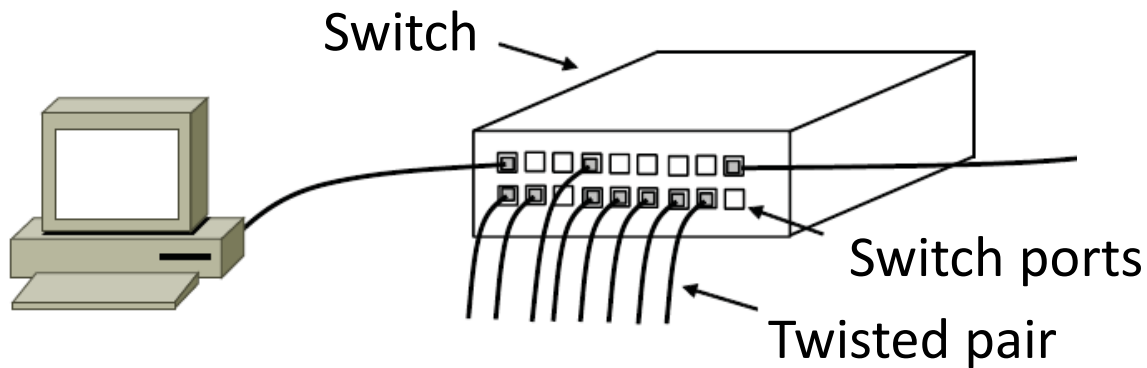
Topic

- How do we connect nodes with a switch instead of multiple access
 - Uses multiple links/wires
 - Basis of modern (switched) Ethernet



Switched Ethernet

- Hosts are wired to Ethernet switches with twisted pair
 - Switch serves to connect the hosts
 - Wires usually run to a closet



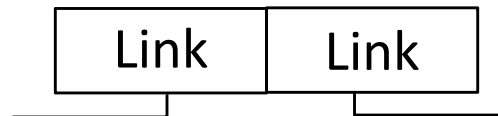
What's in the box?

- Remember from protocol layers:

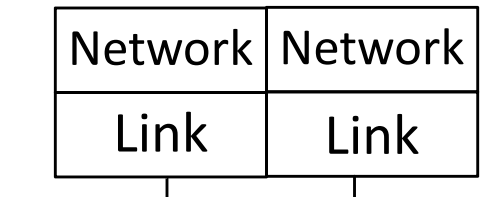
~~Hub~~, or
repeater



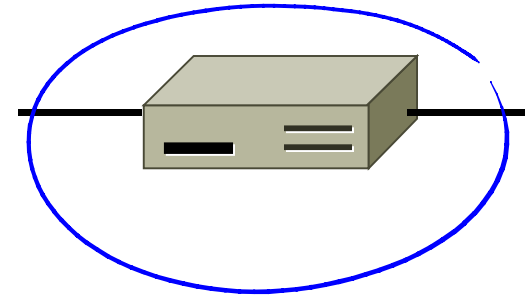
~~Switch~~



~~Router~~

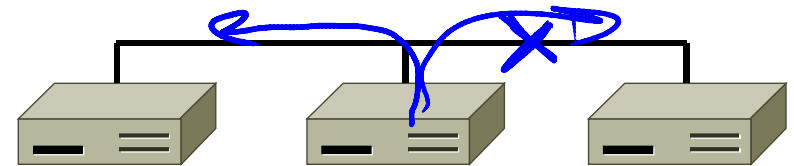
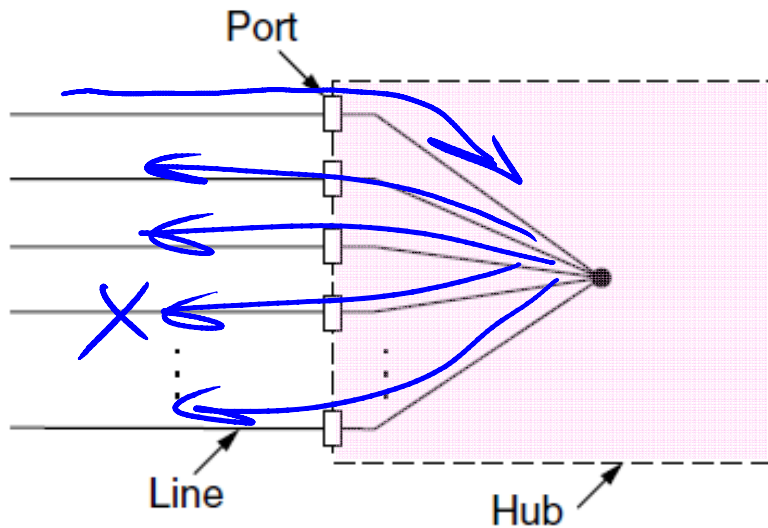


All look like this:



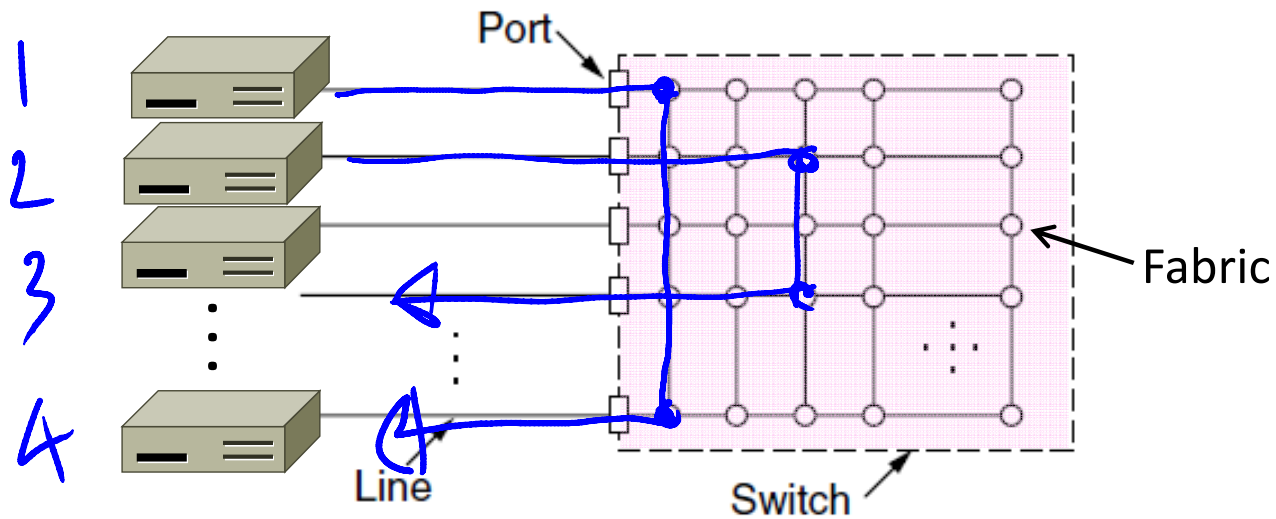
Inside a Hub

- All ports are wired together; more convenient and reliable than a single shared wire



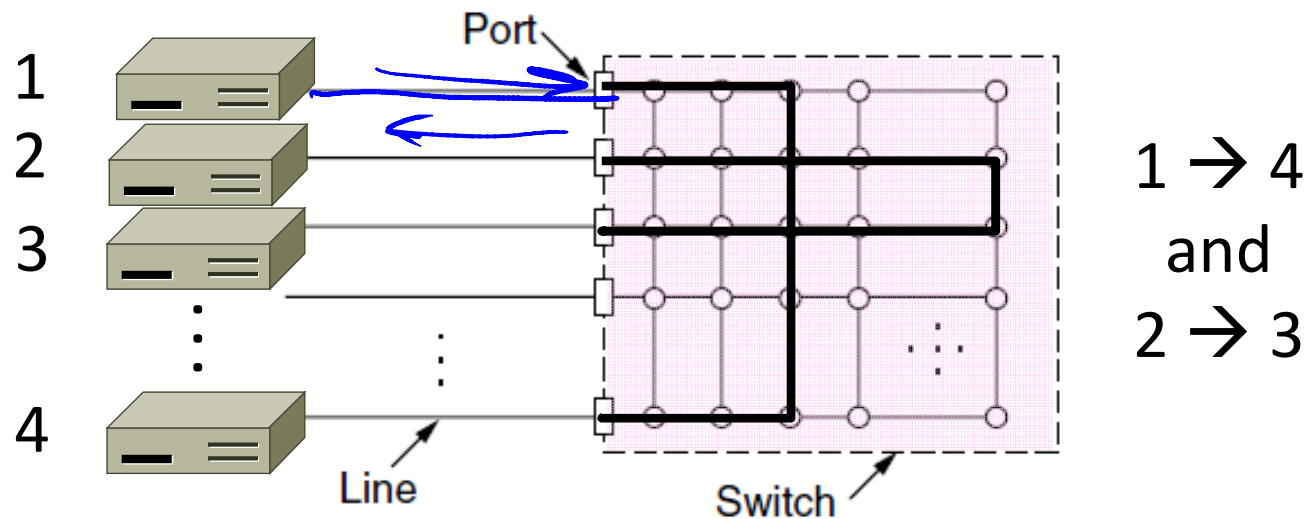
Inside a Switch

- Uses frame addresses to connect input port to the right output port; multiple frames may be switched in parallel



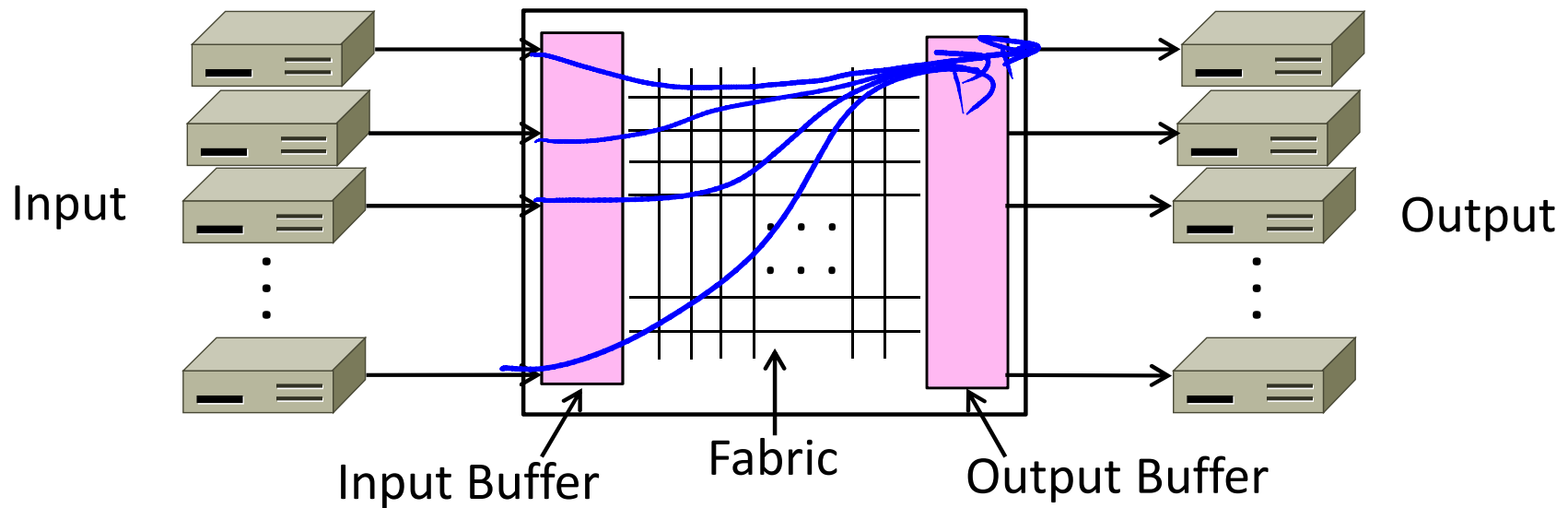
Inside a Switch (2)

- Port may be used for both input and output (full-duplex)
 - Just send, no multiple access protocol



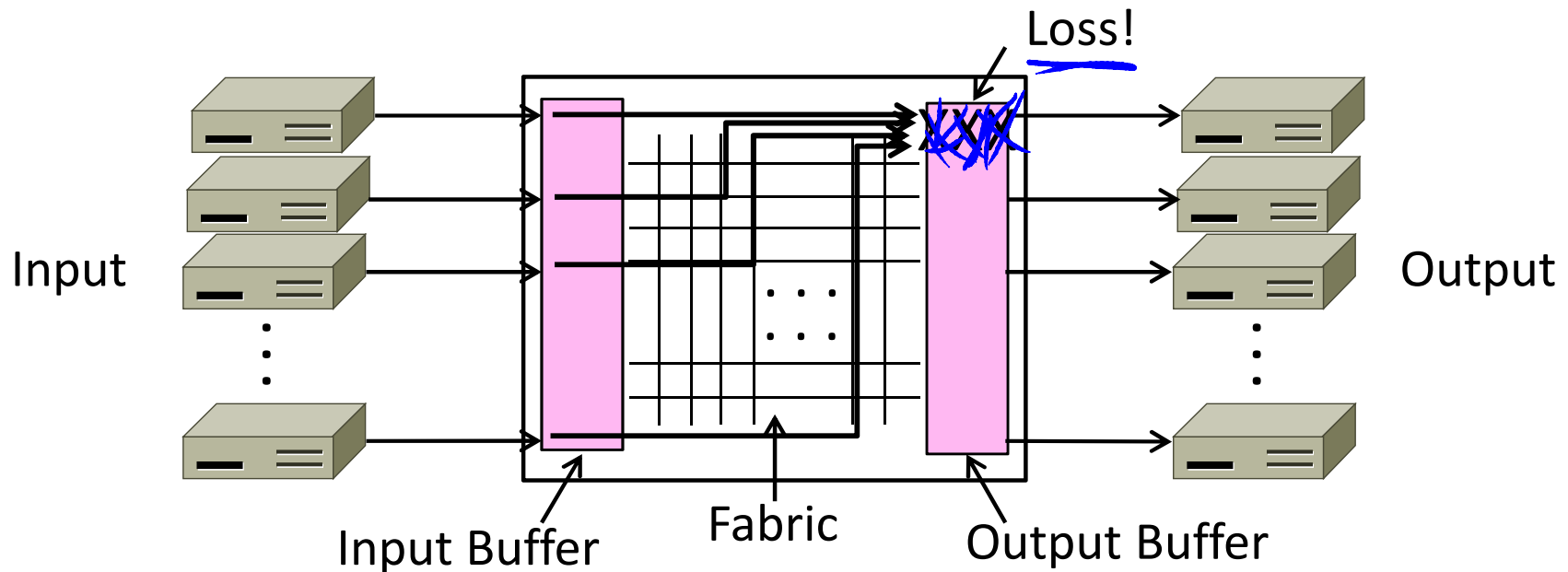
Inside a Switch (3)

- Need buffers for multiple inputs to send to one output




Inside a Switch (4)

- Sustained overload will fill buffer and lead to frame loss

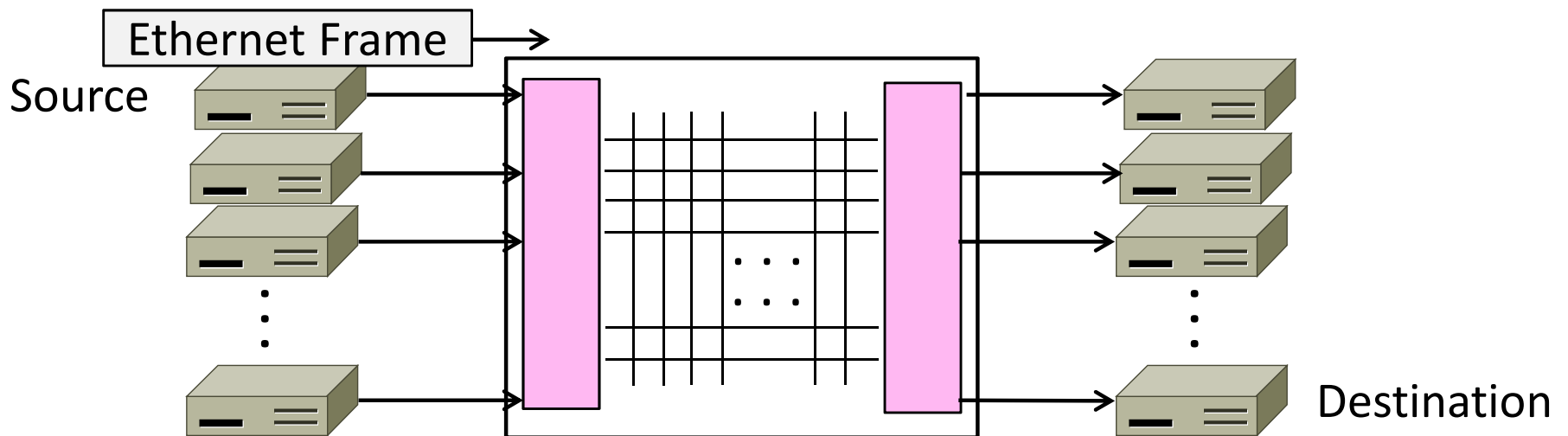


Advantages of Switches

- Switches and hubs have replaced the shared cable of classic Ethernet
 - Convenient to run wires to one location
 - More reliable; wire cut is not a single point of failure that is hard to find
-  Switches offer scalable performance
 - E.g., 100 Mbps per port instead of 100 Mbps for all nodes of shared cable / hub

Switch Forwarding

- Switch needs to find the right output port for the destination address in the Ethernet frame. How?
 - Want to let hosts be moved around readily; don't look at IP

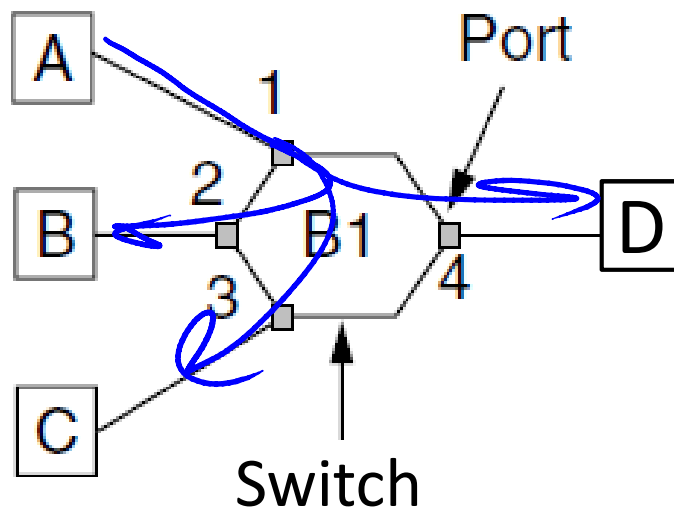


Backward Learning

- Switch forwards frames with a port/address table as follows:
 1. To fill the table, it looks at the **source address** of input frames
 2. To forward, it sends to the port, or else broadcasts to all ports

Backward Learning (2)

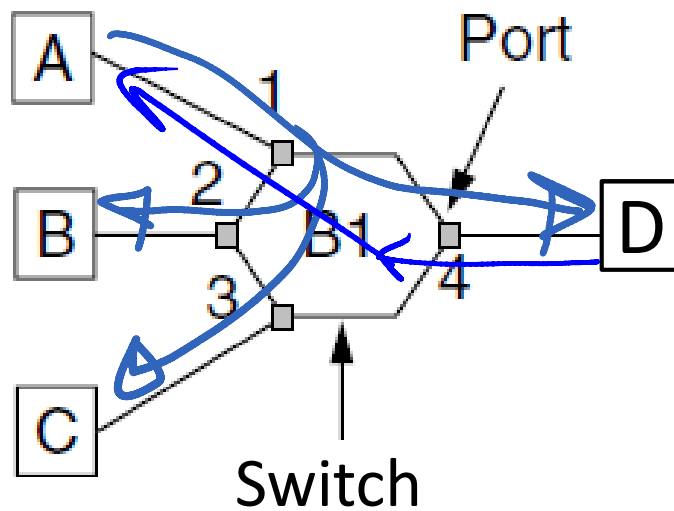
- 1: A sends to D



Address	Port
A	1
B	
C	
D	

Backward Learning (3)

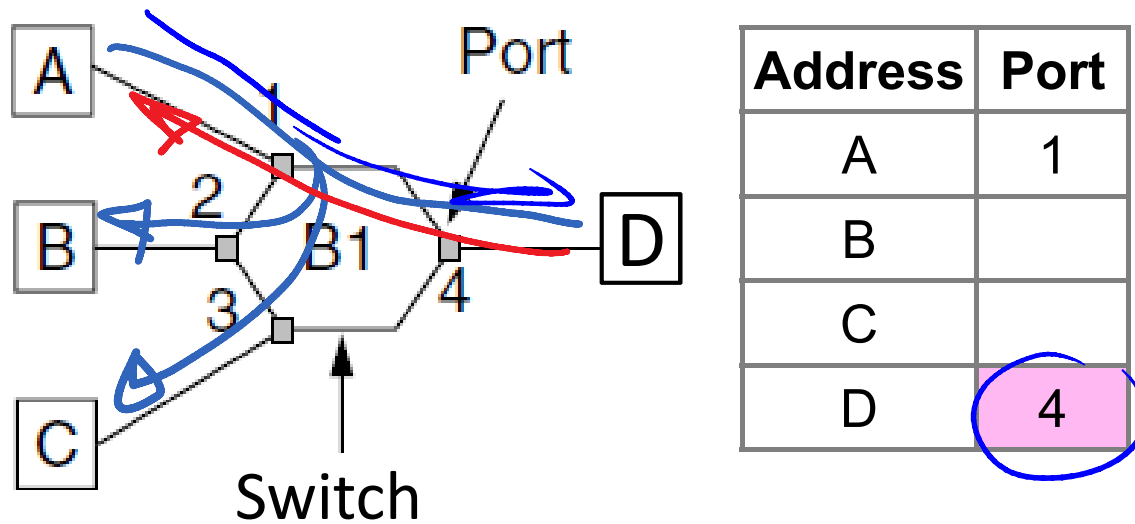
- 2: D sends to A



Address	Port
A	1
B	
C	
D	

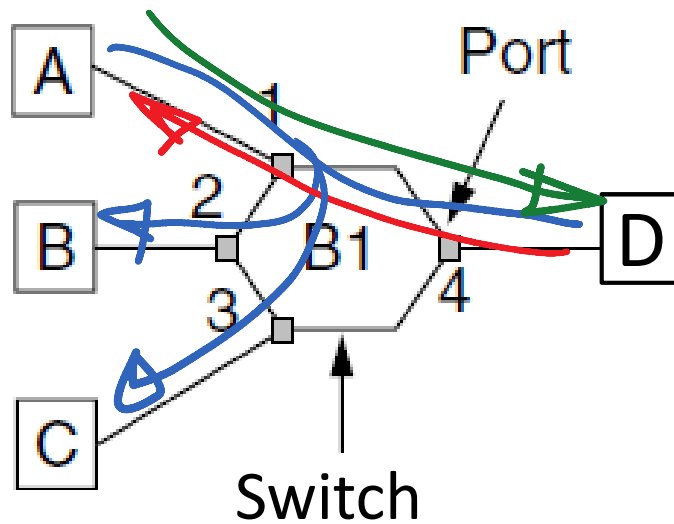
Backward Learning (4)

- 3: A sends to D



Backward Learning (5)

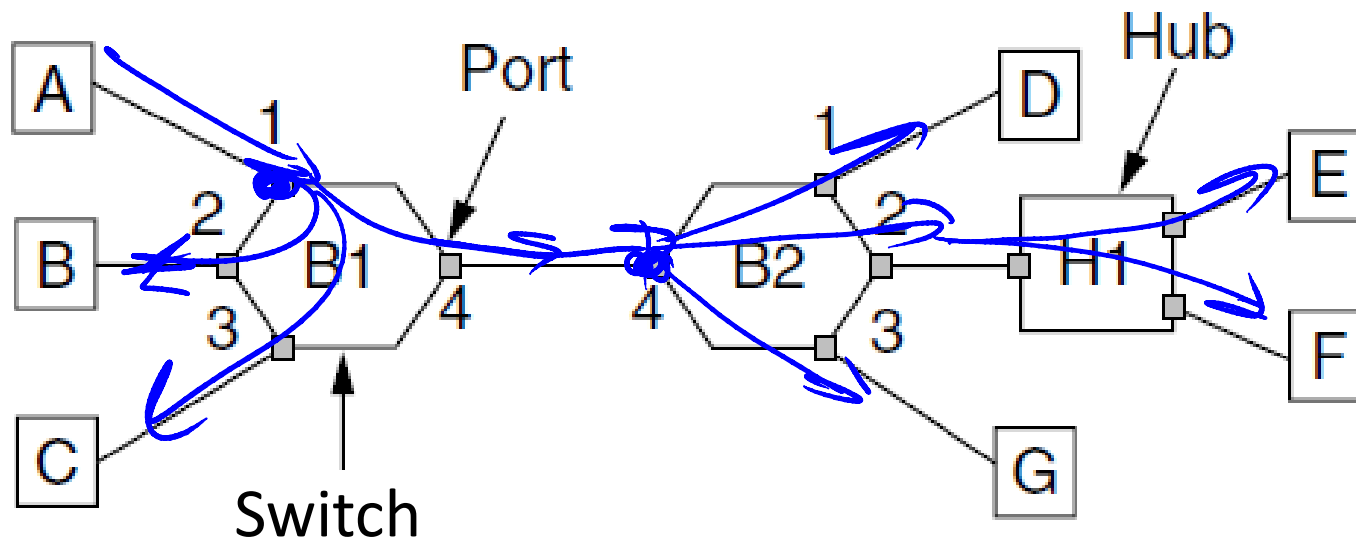
- 3: A sends to D



Address	Port
A	1
B	
C	
D	4

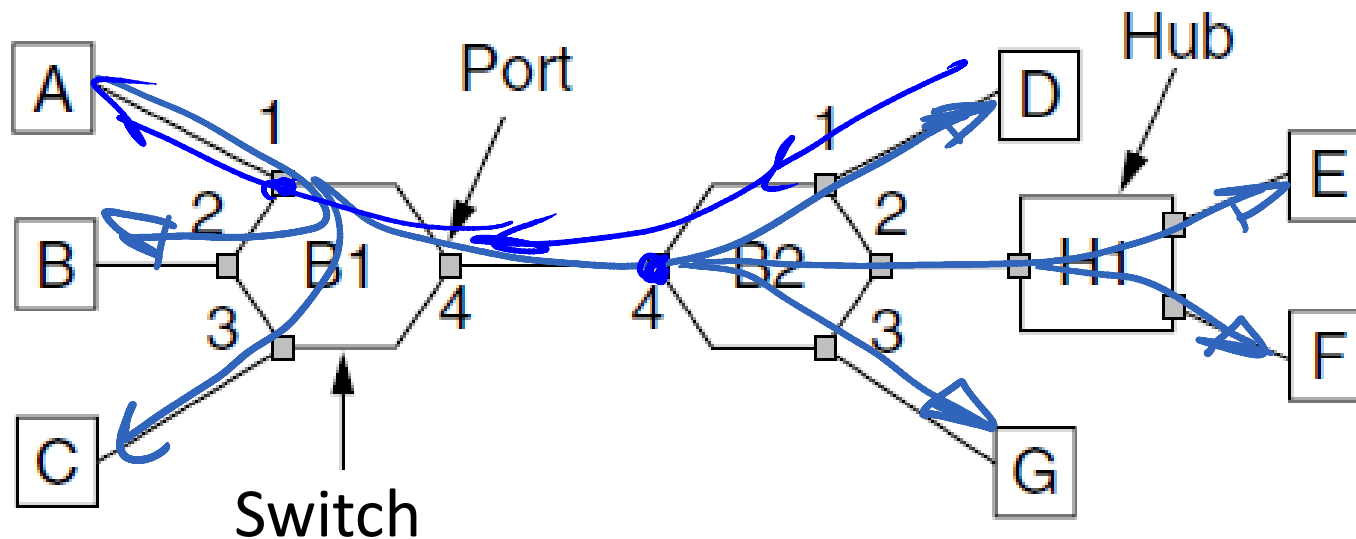
Learning with Multiple Switches

- Just works with multiple switches and a mix of hubs assuming no loops, e.g., A sends to D then D sends to A



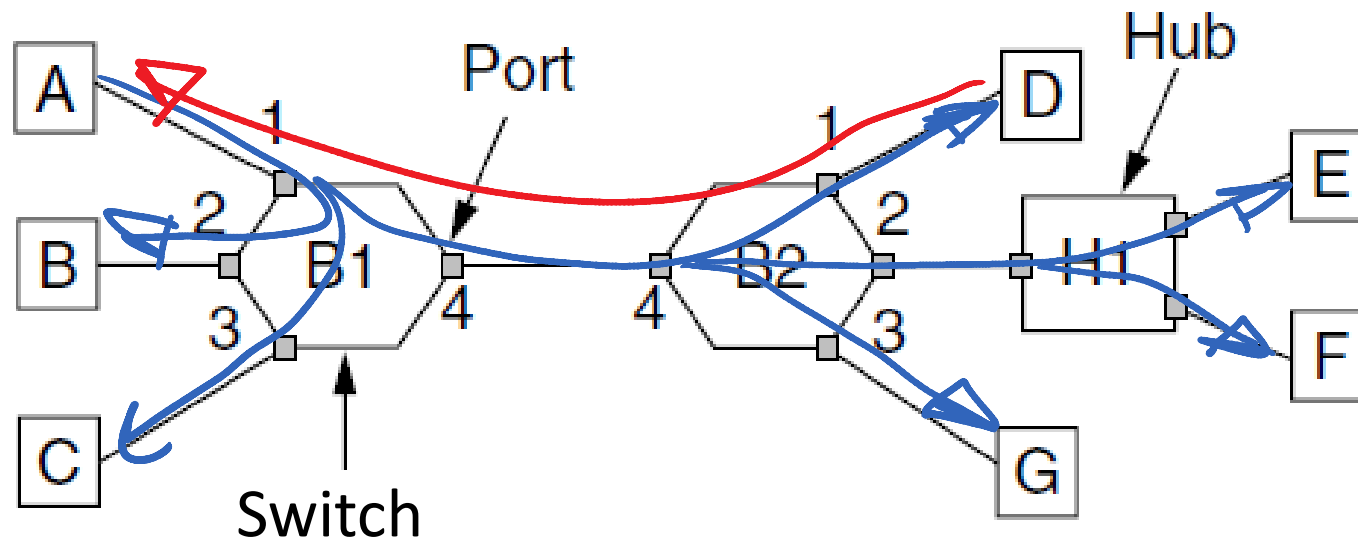
Learning with Multiple Switches (2)

- Just works with multiple switches and a mix of hubs assuming no loops, e.g., A sends to D then D sends to A



Learning with Multiple Switches (3)

- Just works with multiple switches and a mix of hubs *assuming no loops*, e.g., A sends to D then D sends to A



END

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