CSC4200/5200 – COMPUTER NETWORKING

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INTERNETWORKING

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Tennessee TECH

Exam! (Chapter 1 – 4)

- Sept. 30th

  - 55 minutes – 11:15-12:10.
  - **If you have a conflict, let me know NOW!**
  - Location – iLearn.

- Only from the book and lecture notes, no programming questions

Project groups

- Let me know by 09/20, Friday.
  - If I don’t hear from you by Friday, you will be assigned to a random group!

Exam

- What do I study?
  - Think about the fundamentals
    - Why this protocols are designed this way?
      - **Why not use bit correction on Ethernet frames?**
      - **Why use CSMA/CA for wireless and not CSMA/CD?**
    - What will happen if I change this aspect of the protocol?
      - **What will happen if we make the sliding window infinite?**
    - Simple calculations
      - **Calculate the total delay of a link**
    - **Study the homeworks!**

Apps (HTTP)

Data

Apps (HTTP)

Transport (TCP/UDP)

Segments

Transport (TCP/UDP)

Network (IP)

Packets

Network (IP)

Link (Ethernet)

Frames

Ethernet Interface

Ethernet Interface

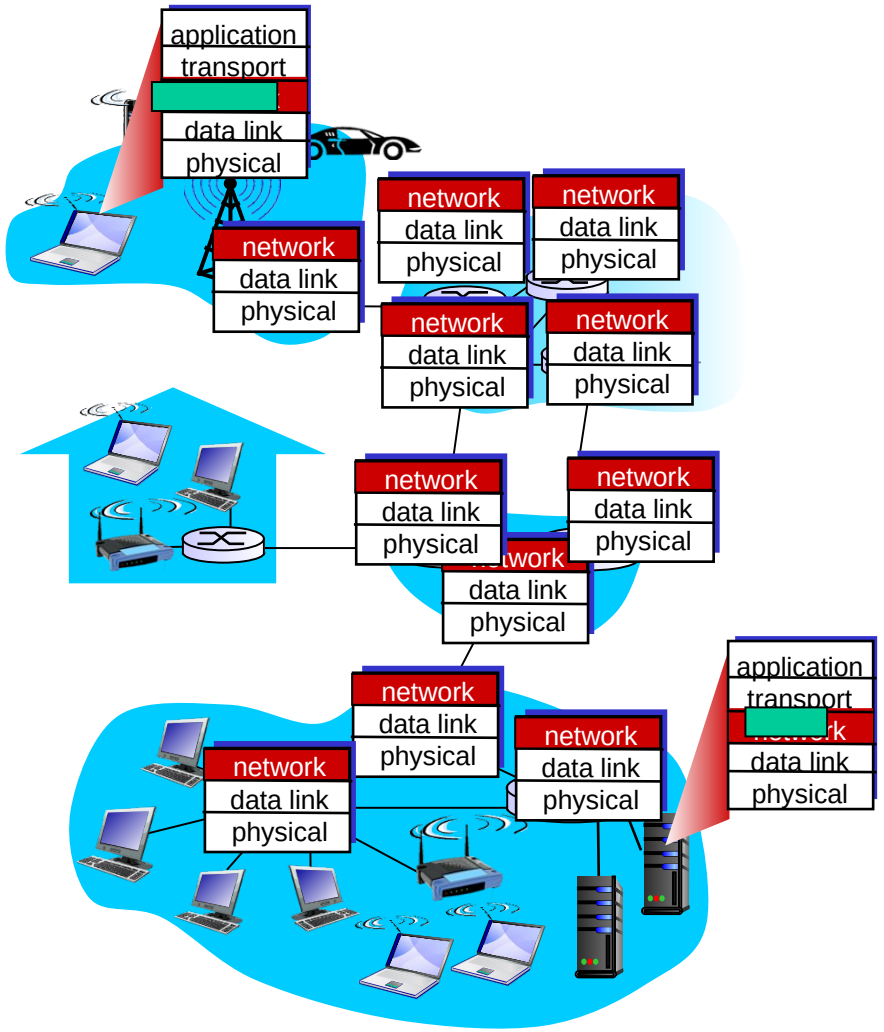
Link (Ethernet)

Bits (1010001)

So far...

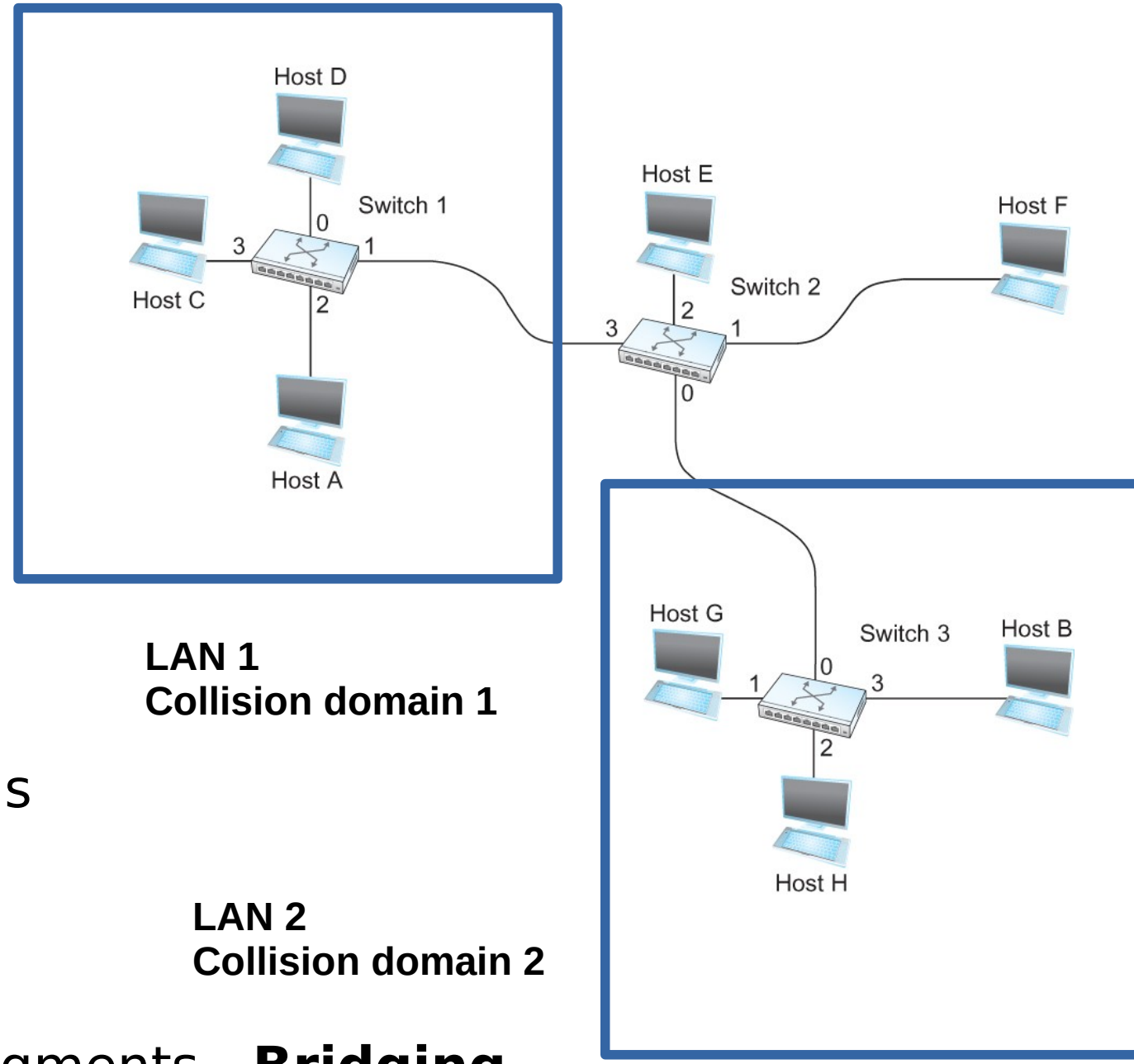
- we saw how to build a local network
- How do we interconnect different types of networks to build a large global network?

Why another layer?

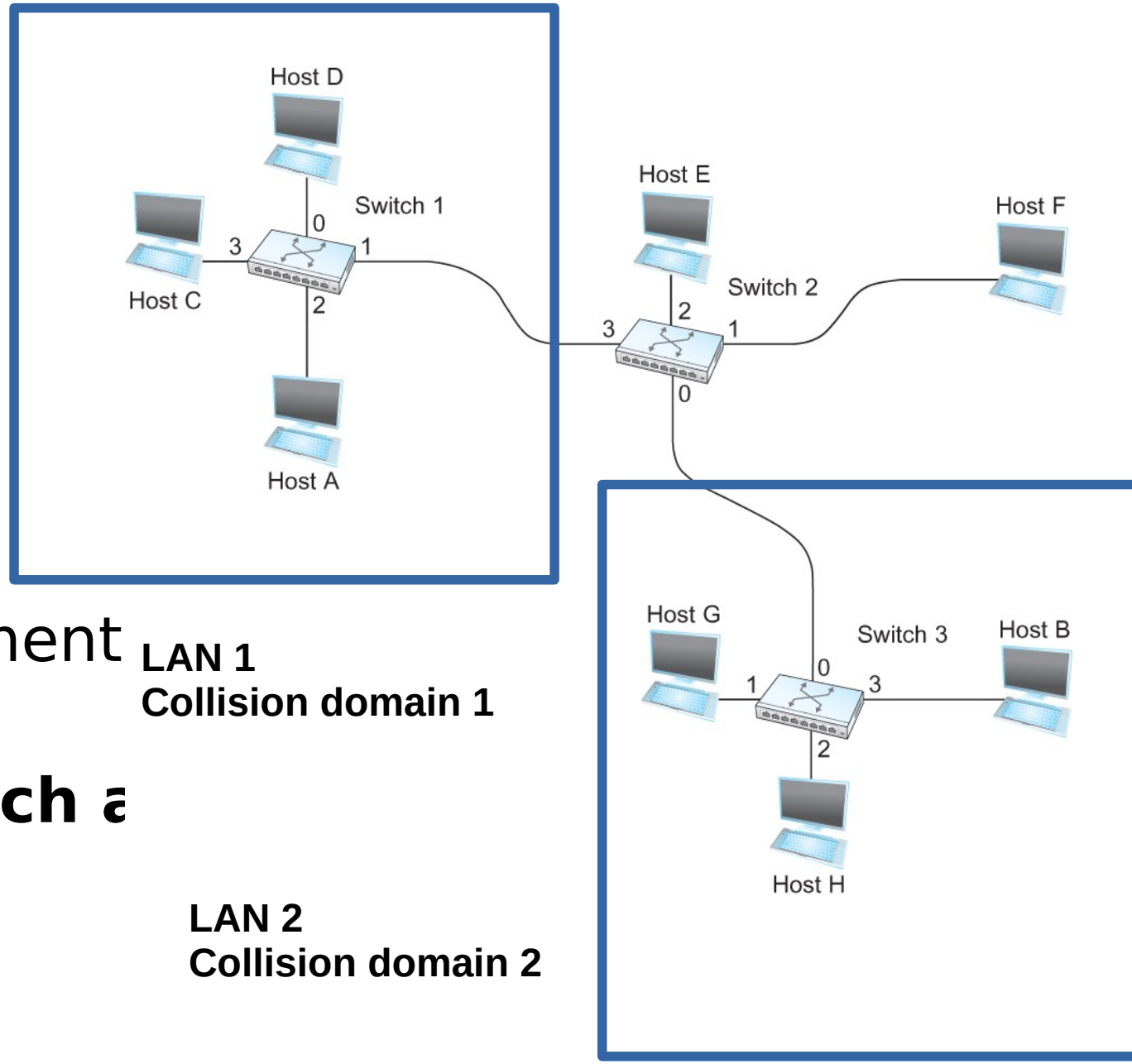


Switching

- Switch
  - A mechanism to interconnect links to form a large network
  - Forward **frames**
  - Separate the collision domains
  - Filter packets between LANs
  - Connects two or more LAN segments - **Bridging**



Switches are Self learning!



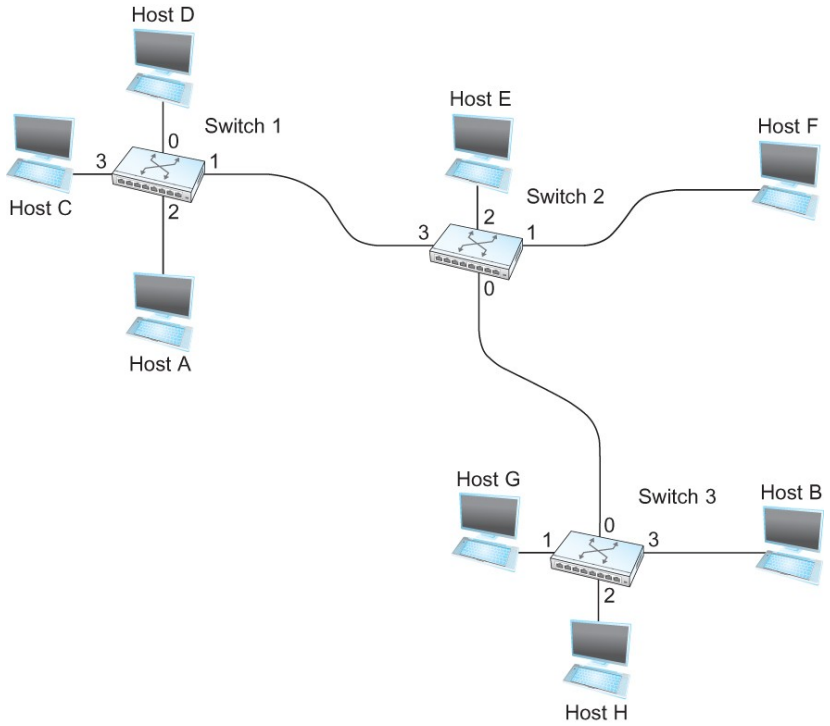
- No configuration needed
- Send frames to needed segment
- **How do they construct such a table?**

Switches are self learning!

- Inspect the source MAC address
  - **What is a mac address?**
- Associate mac address and incoming interface
- Store this association for later use, (for some time)
  - aging-timer

Switching Table

- To decide how to forward a packet, a switch consults a *forwarding table*

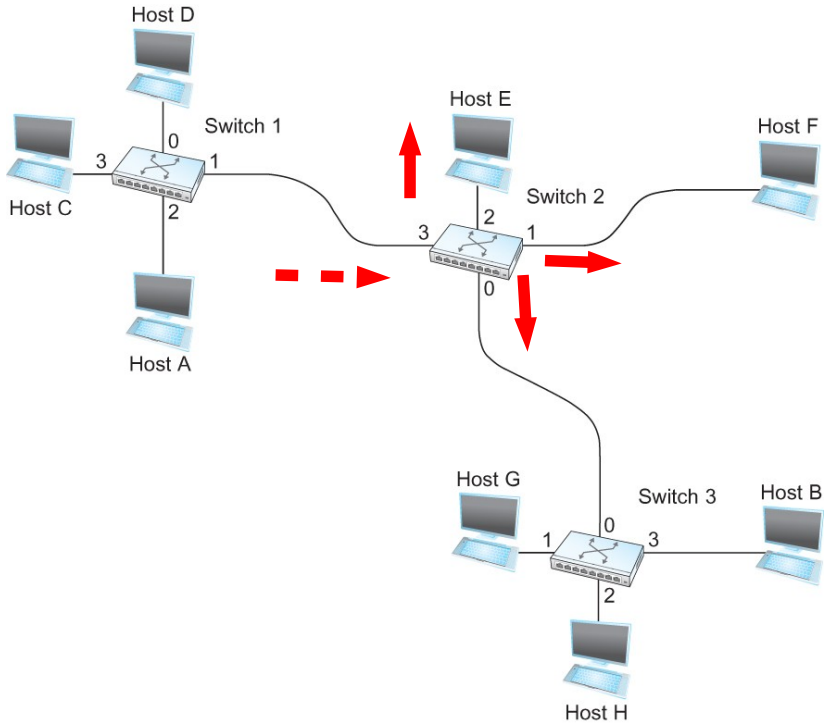


Destination	Port
A	3
B	0
C	3
D	3
E	2
F	1
G	0
H	0

Forwarding Table for Switch 2

Switching Table

- Unknown destination → send out on all Interfaces **(flooding)**
  - **Skip the incoming interface**

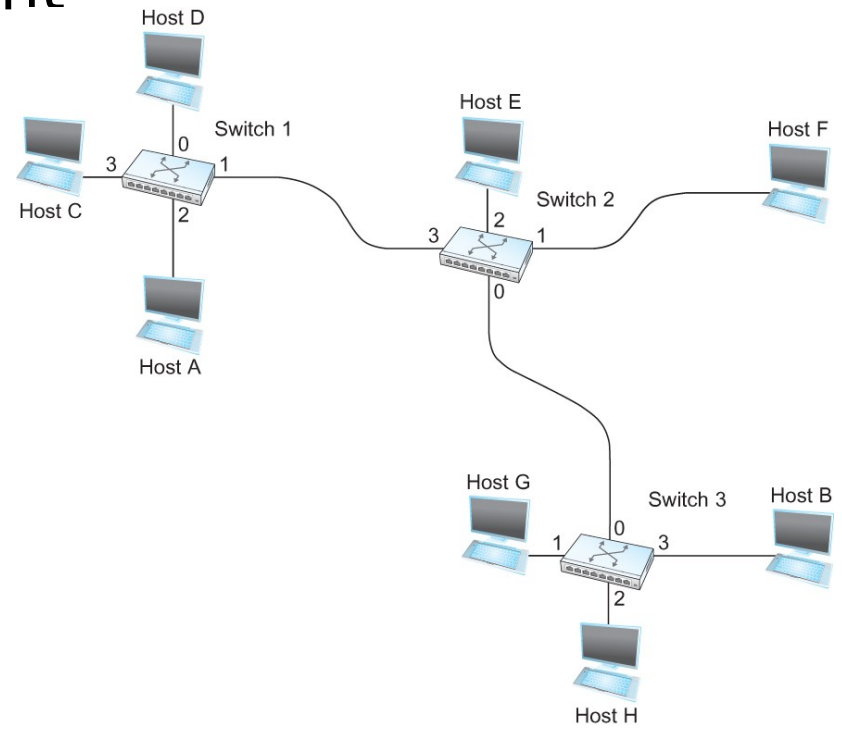


Destination, Port	
	--
A	3
B	0
C	3
D	3
E	2
F	1
G	0
H	0

Forwarding Table for Switch 2

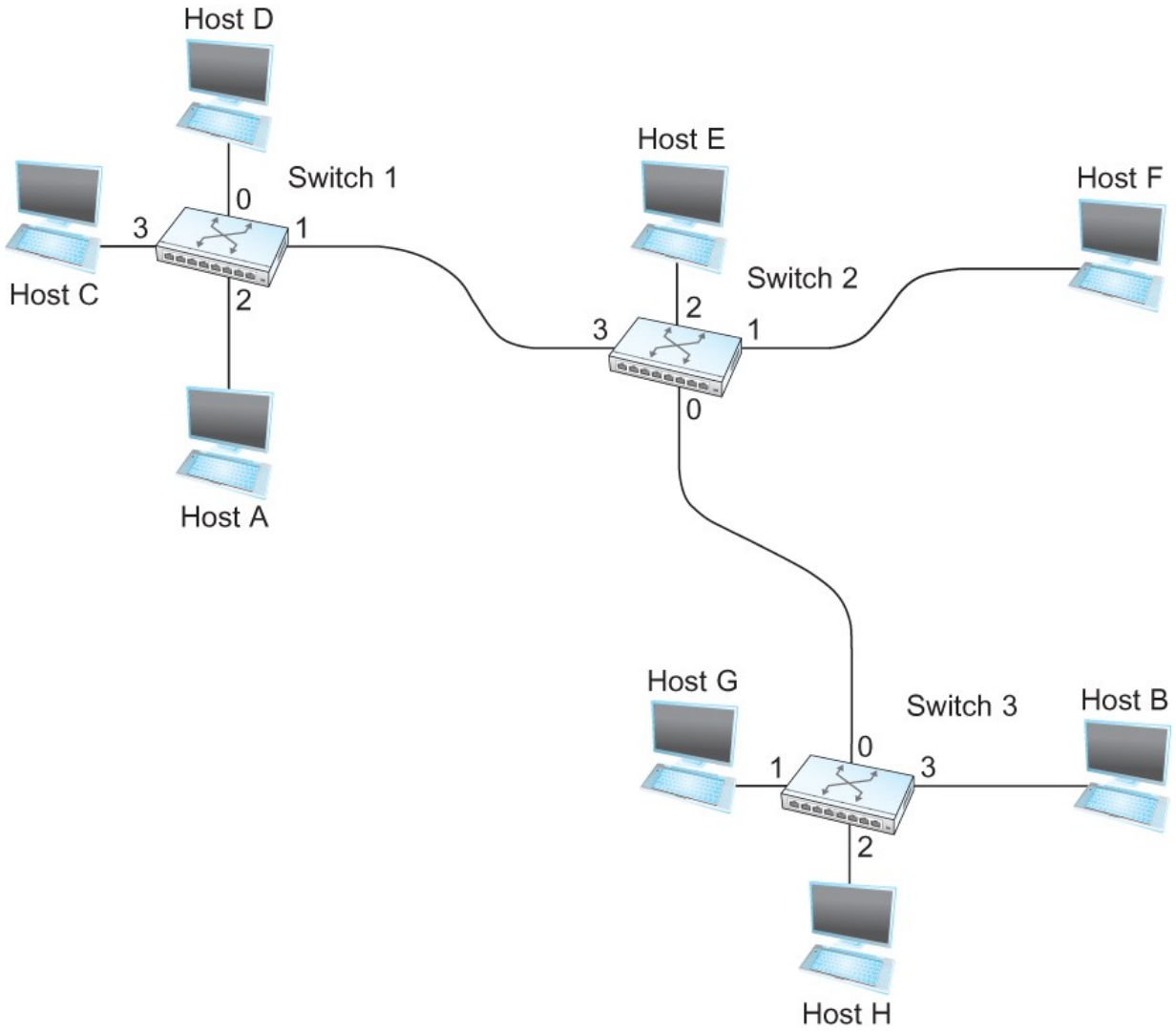
Switching Table Algorithm

- Create the table first!
  - **For each packet**
    - If destination address in arriving segment
      - Drop
    - If destination is in another segment
      - Forward
    - If destination unknown
      - Flood!

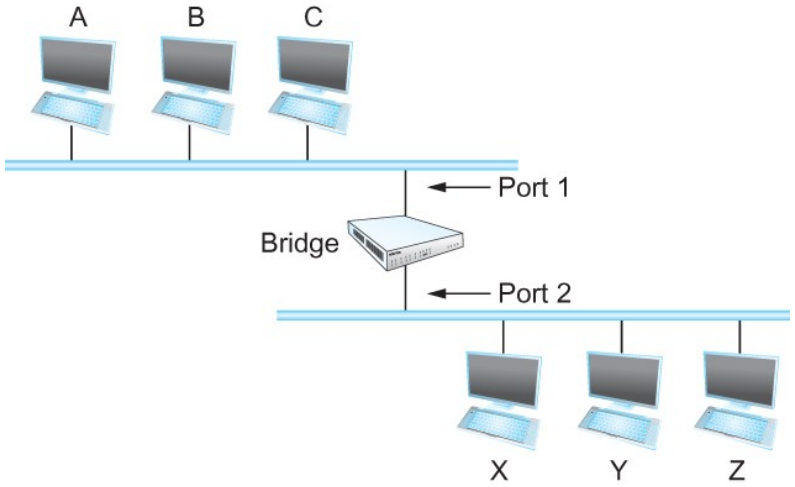


Switching Table Algorithm

- **Send frame from C to F**
- Switch 1 →
  - Notes C is on Interface 3
  - Floods
- Switch 2 →
  - Notes C is on Interface 3
  - Floods
- Host F replies
  - Switch 2 notes F is on Interface 1
  - Sends back over Interface 3
- Switch 1 notes F is on Interface 1
  - Sends back over Interface 3
  - Host c receives frame



Bridges

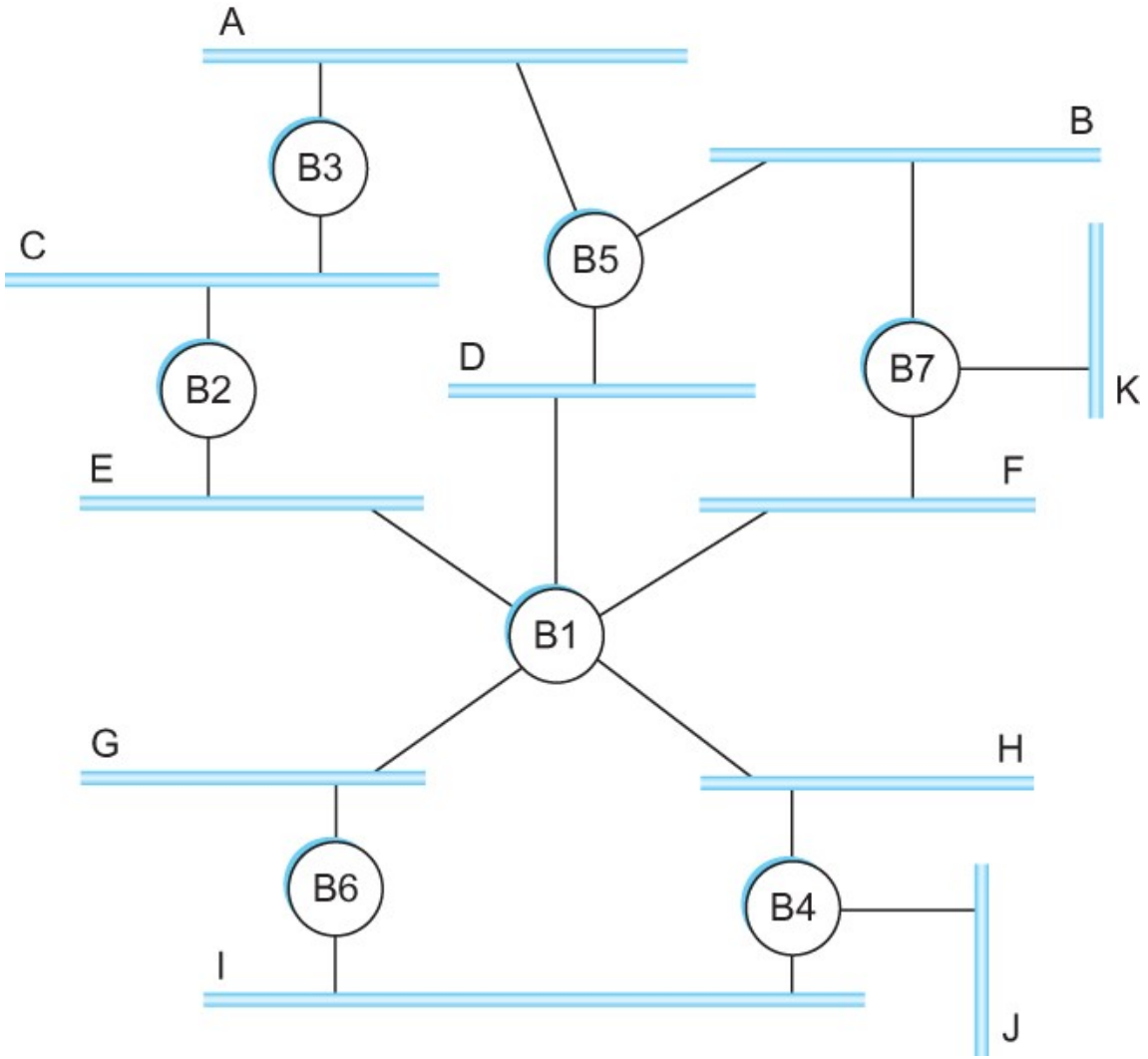


- Bridges and LAN Switches
  - Class of switches that is used to forward packets between shared-media LANs such as Ethernets
  - Known as LAN switches
  - Referred to as Bridges

- Suppose you have a pair of Ethernets that you want to interconnect
  - One approach is put a repeater in between them, physical limitations

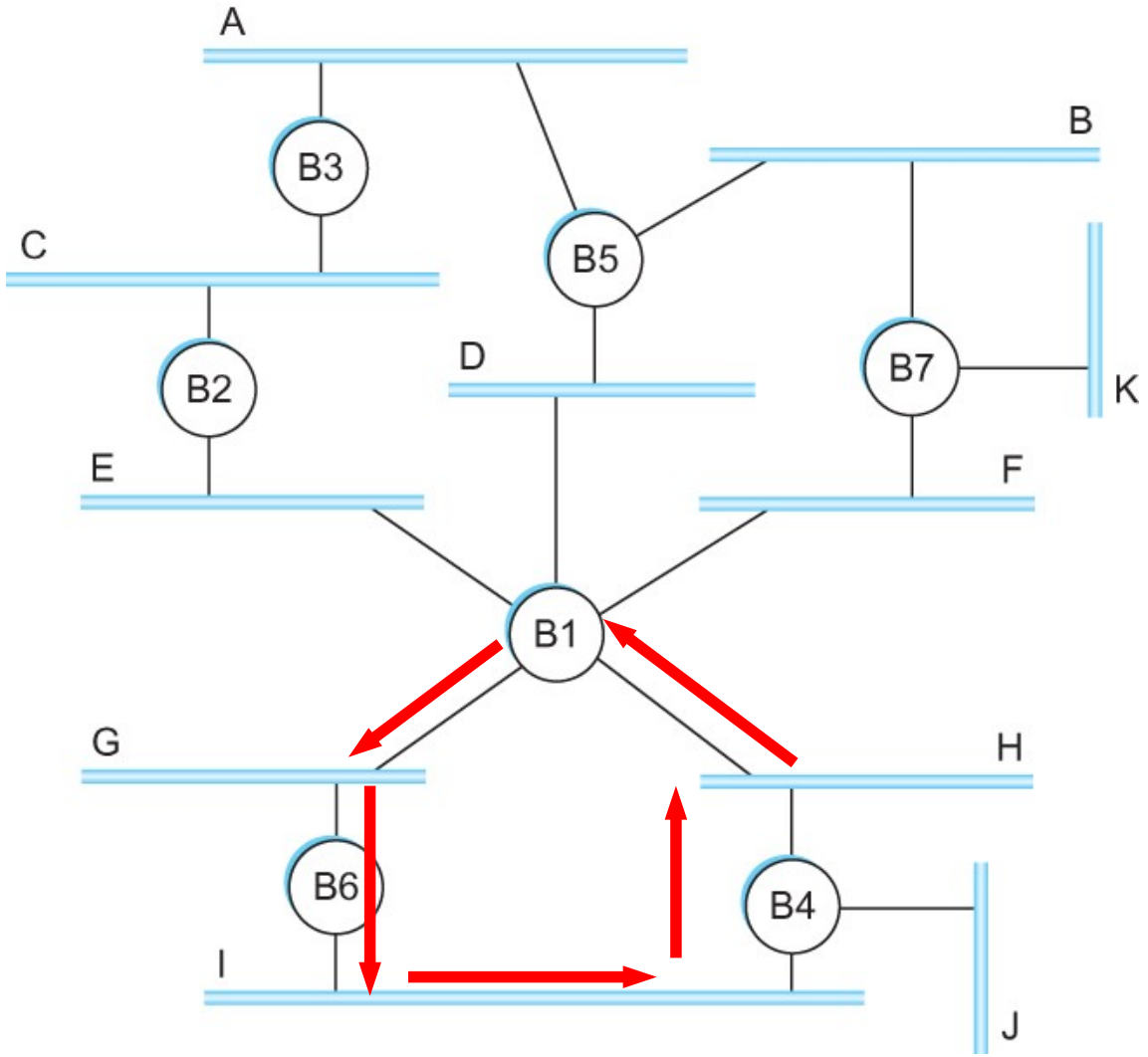
- An alternative would be to put a node between the two Ethernets and have the node forward frames from one Ethernet to the other
  - This node is called a **Bridge**
  - A collection of LANs connected by one or more bridges is usually said to form an **Extended LAN**

Flooding over bridges causes forwarding loops



Spot the loop
Why?

Loop

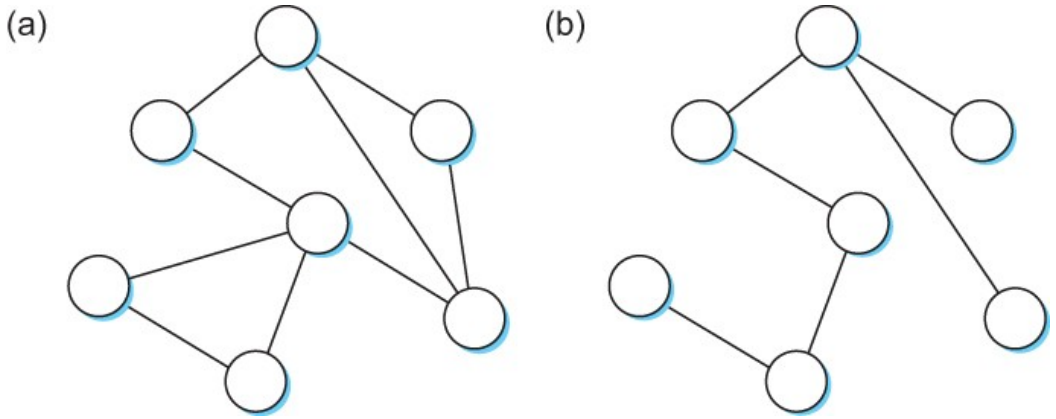


Spot the loop
Why?

Solution? Spanning Tree

Think of the extended LAN as being represented by a graph that possibly has loops (cycles)

- A spanning tree is a sub-graph of this graph that covers all the vertices but contains no cycles
- Spanning tree keeps all the vertices of the original graph but throws out some of the edges



Example of (a) a cyclic graph; (b) a corresponding spanning tree.

Next Steps

How to construct a spanning tree!
Virtual LANs
IP

Link Layer Recap – All this for a cat picture