

CSC4200/5200 – COMPUTER NETWORKING

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INTERNETWORKING

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Midterm! Midterm! Midterm! (Chapter 1 – 4)

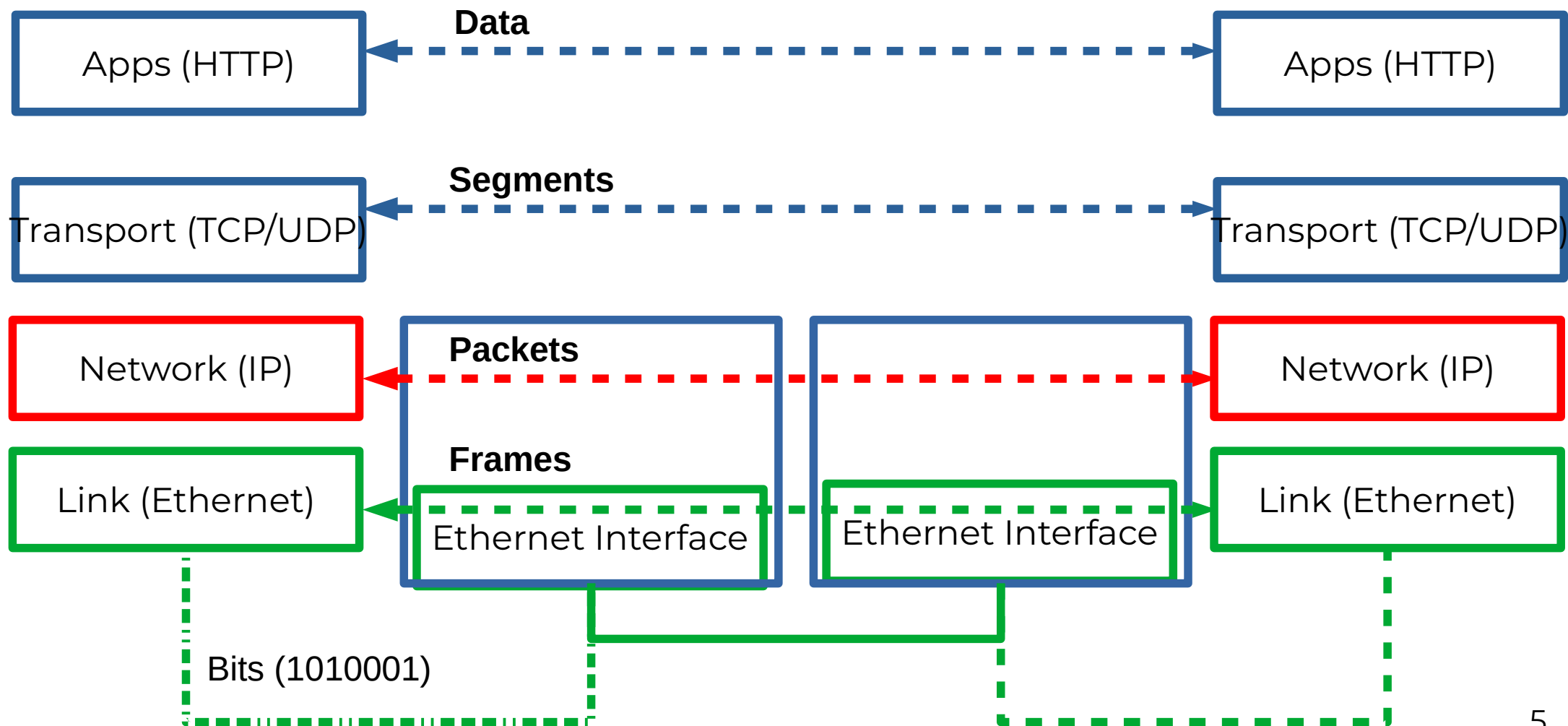
- October 11th (In less than a month!)
 - 90 minutes – 1:15PM – 2:30PM
 - **If you have a conflict, let me know NOW!**
 - Location – TBD
- Closed book, no laptop, phone, or calculator!
- One cheat sheet allowed (one letter paper – any note you want)
- Only from the book and lecture notes, no programming 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!

Midterm! Midterm! Midterm! (Chapter 1 – 4)

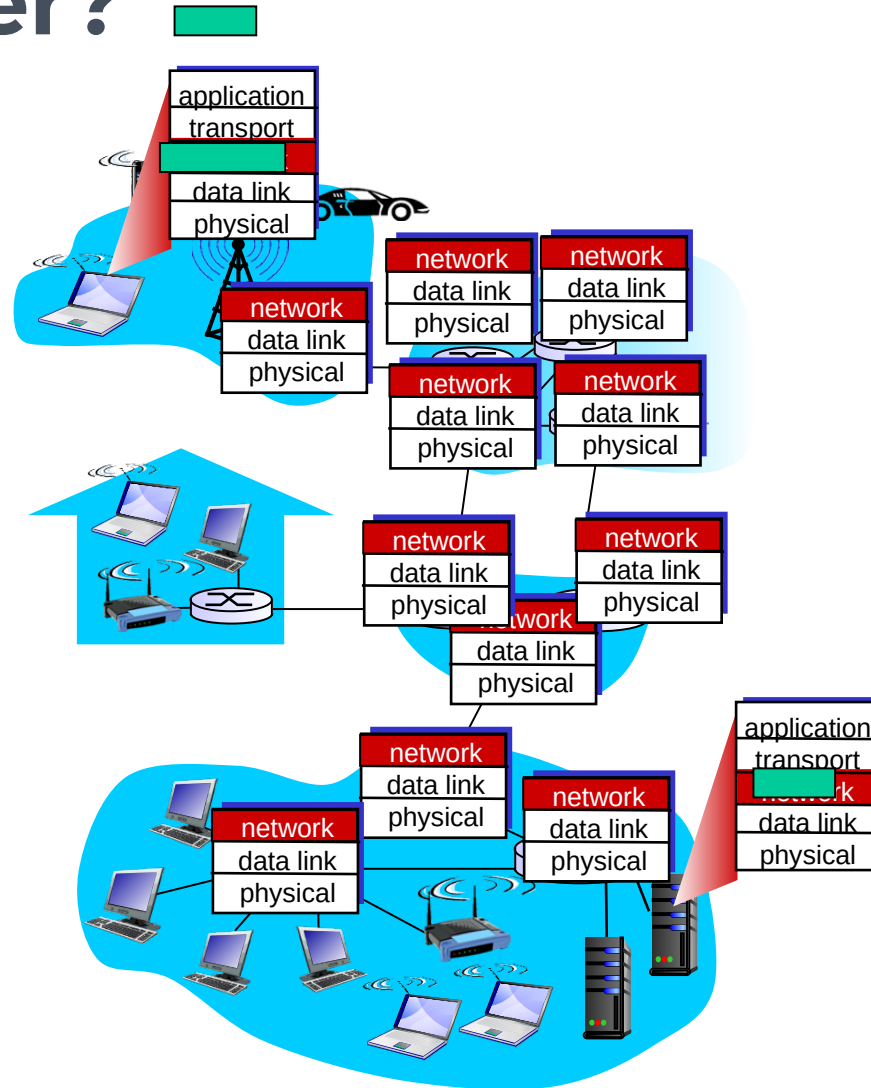
- What do I study?
 - Think about the fundamentals
 - Why this protocols are designed this way?
 - **Why not use bit correction on Ethernet frames?**
 - **Why use CSMA/CA for wireless and not CSMA/CD?**
 - What will happen if I change this aspect of the protocol?
 - **What will happen if we make the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



So far...

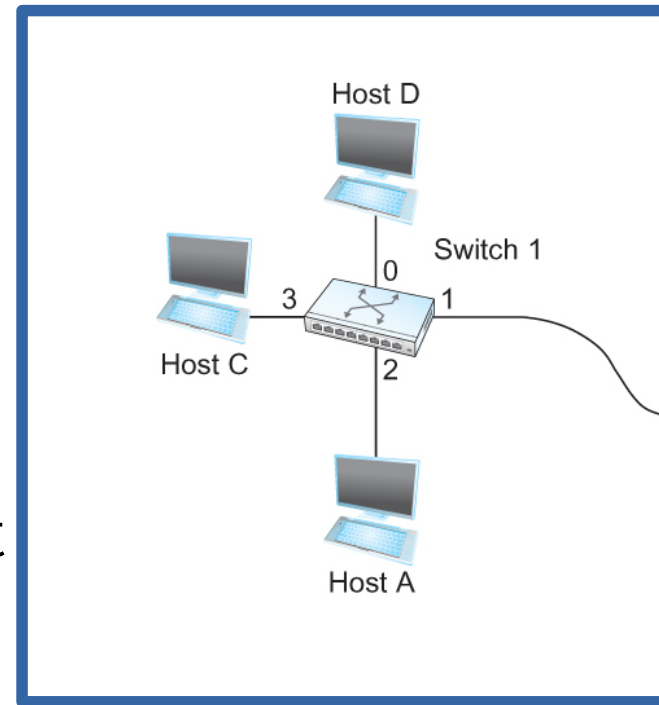
- we saw how to build a local network
- How do we interconnect different types of networks to build a large global network?

Why another layer?

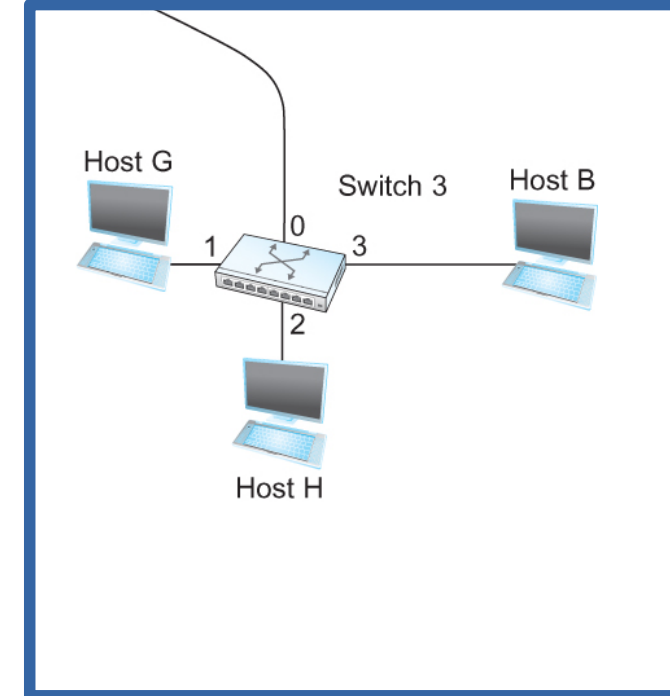
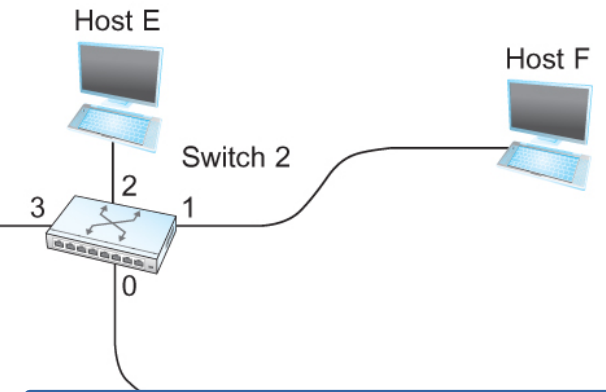


Switching

- 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**



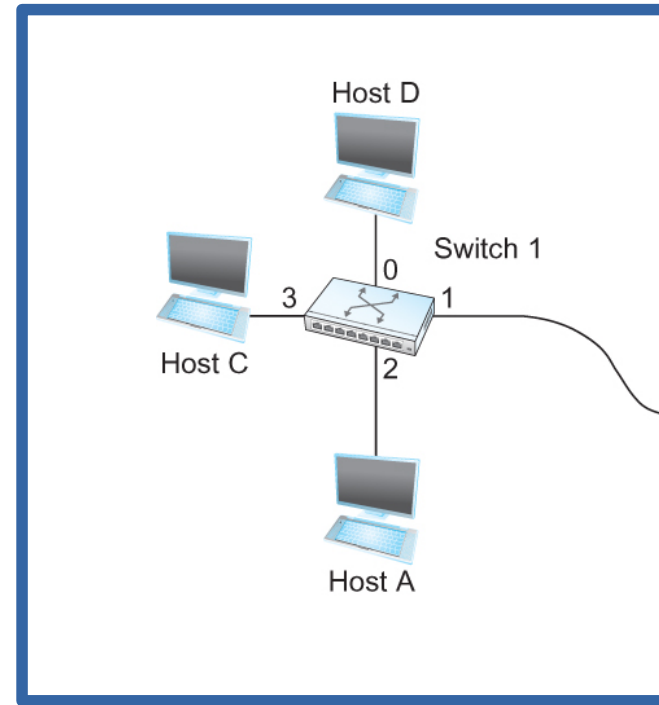
LAN 1
Collision domain 1



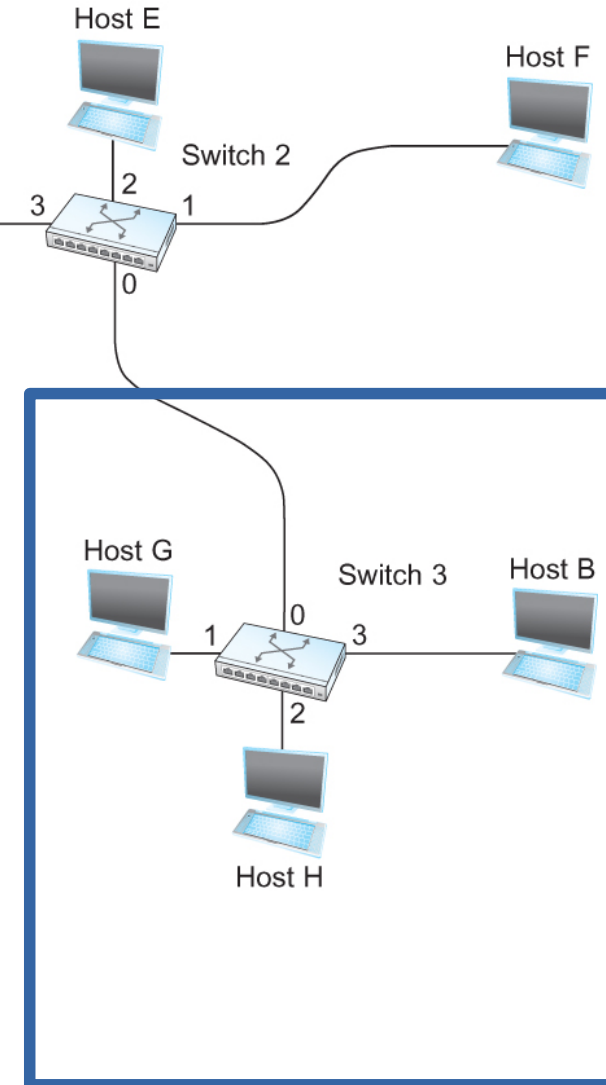
LAN 2
Collision domain 2

Switches are Self learning!

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



LAN 1
Collision domain 1

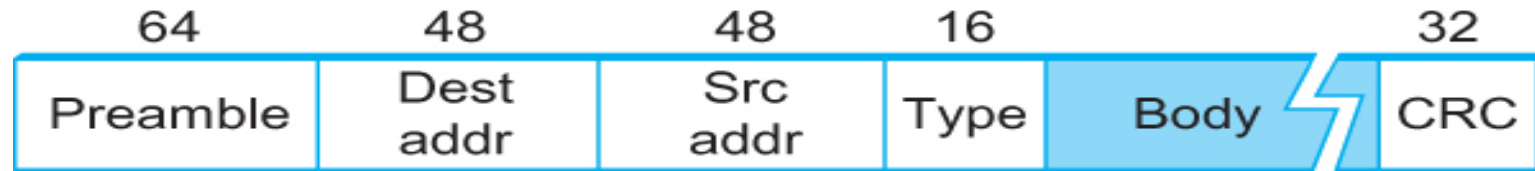


LAN 2
Collision domain 2

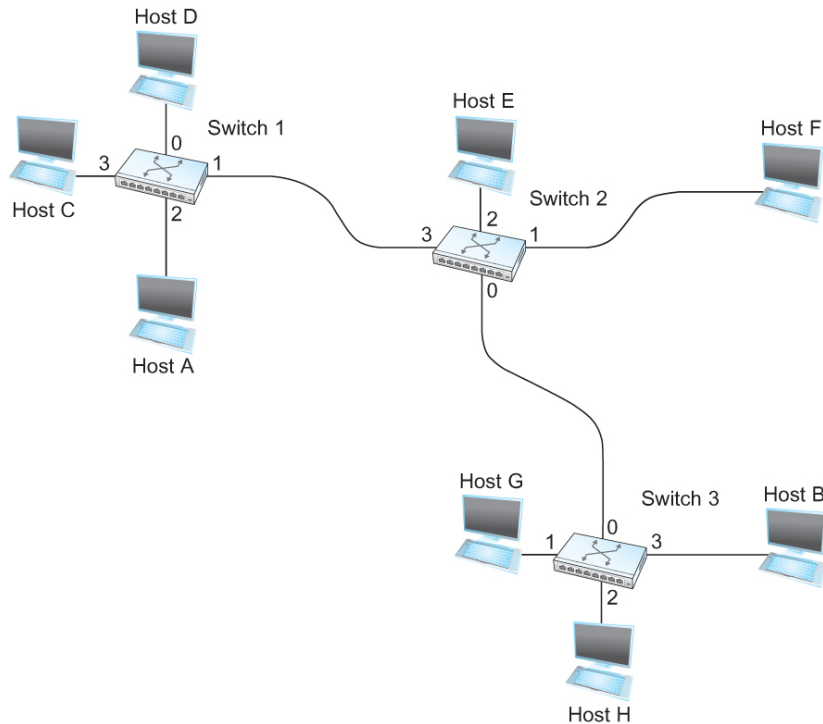
Switches are self learning!

- 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

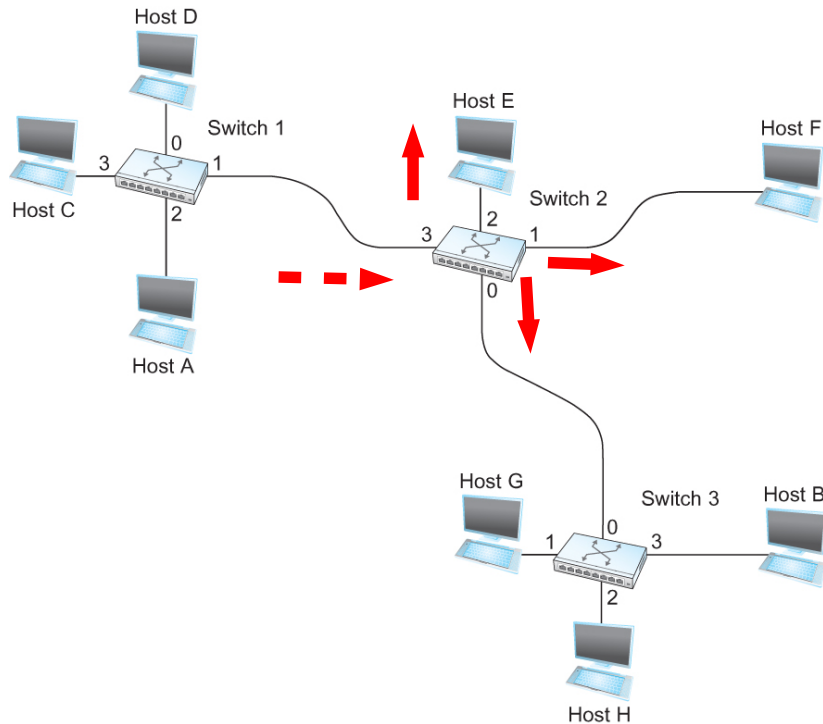
A 3
B 0
C 3
D 3
E 2
F 1
G 0
H 0

**Forwarding Table for
Switch 2**

Switching Table

- Unknown destination → send out on all Interfaces (**flooding**)

- **Skip the incoming interface**



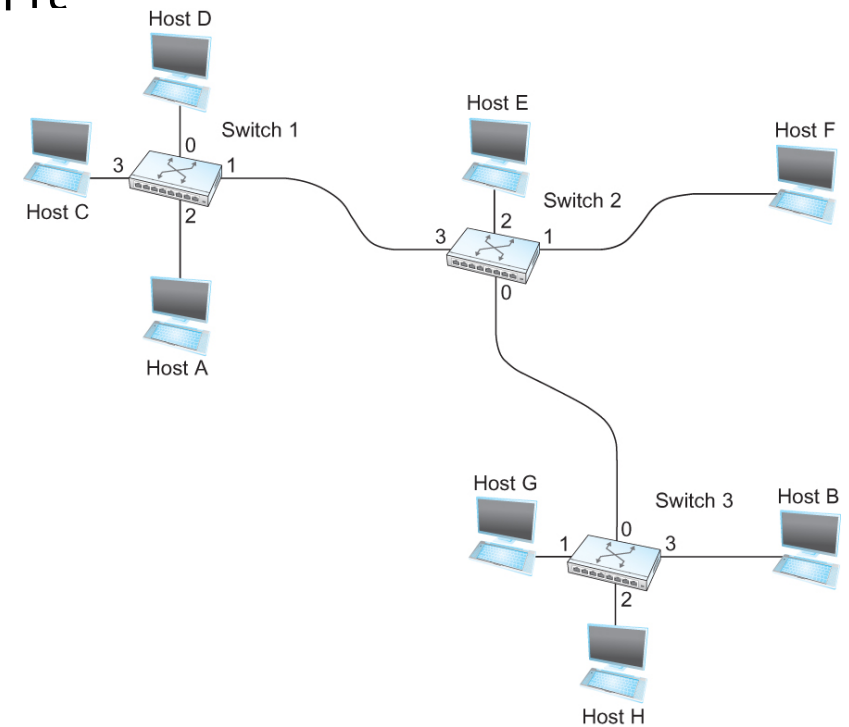
Destination, Port

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

**Forwarding Table for
Switch 2**

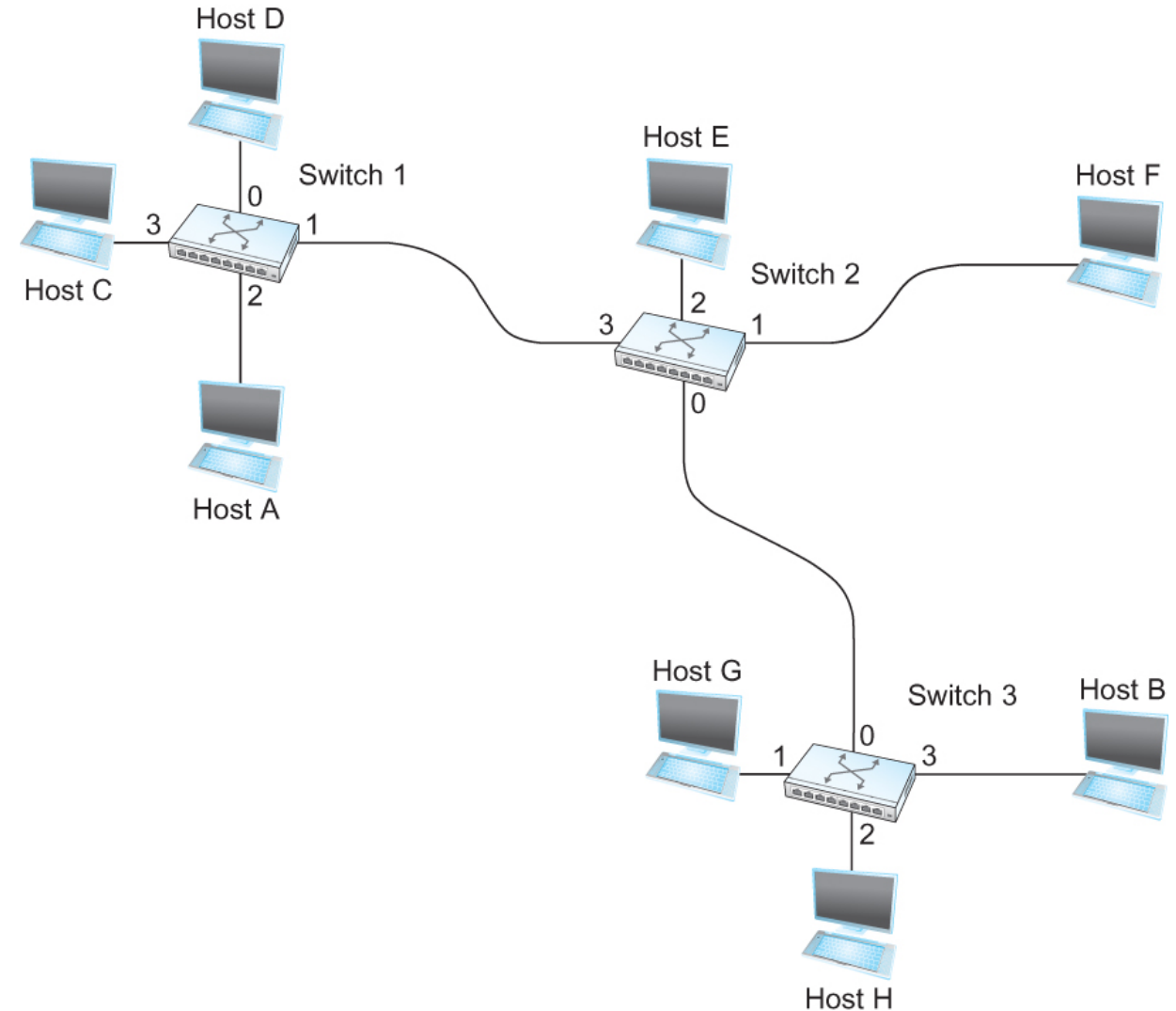
Switching Table Algorithm

- 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!

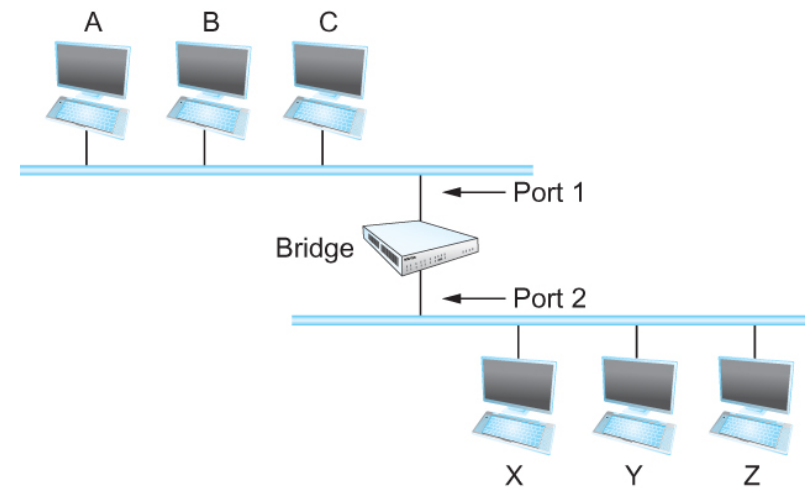


Switching Table Algorithm

- **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

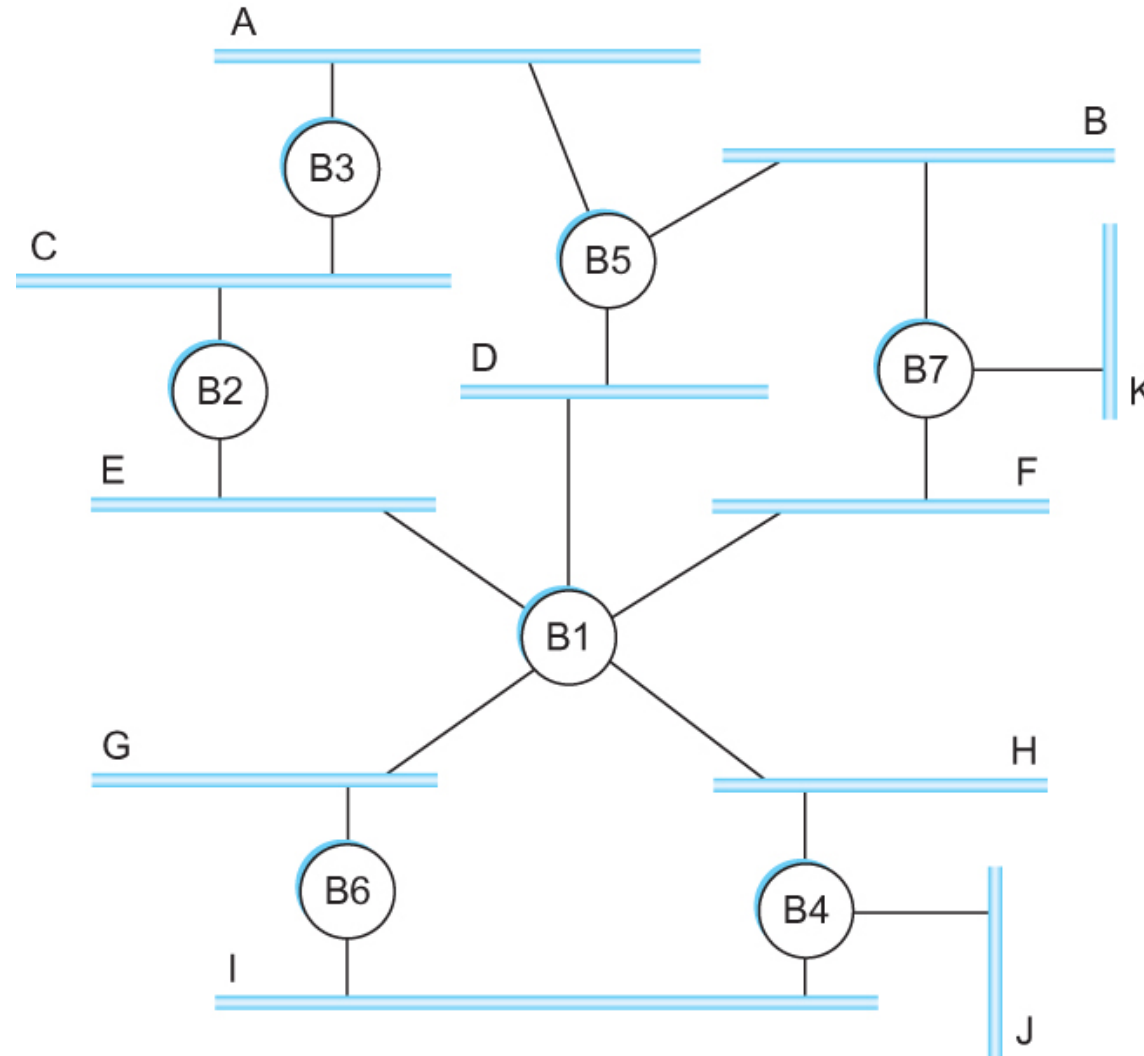


Bridges



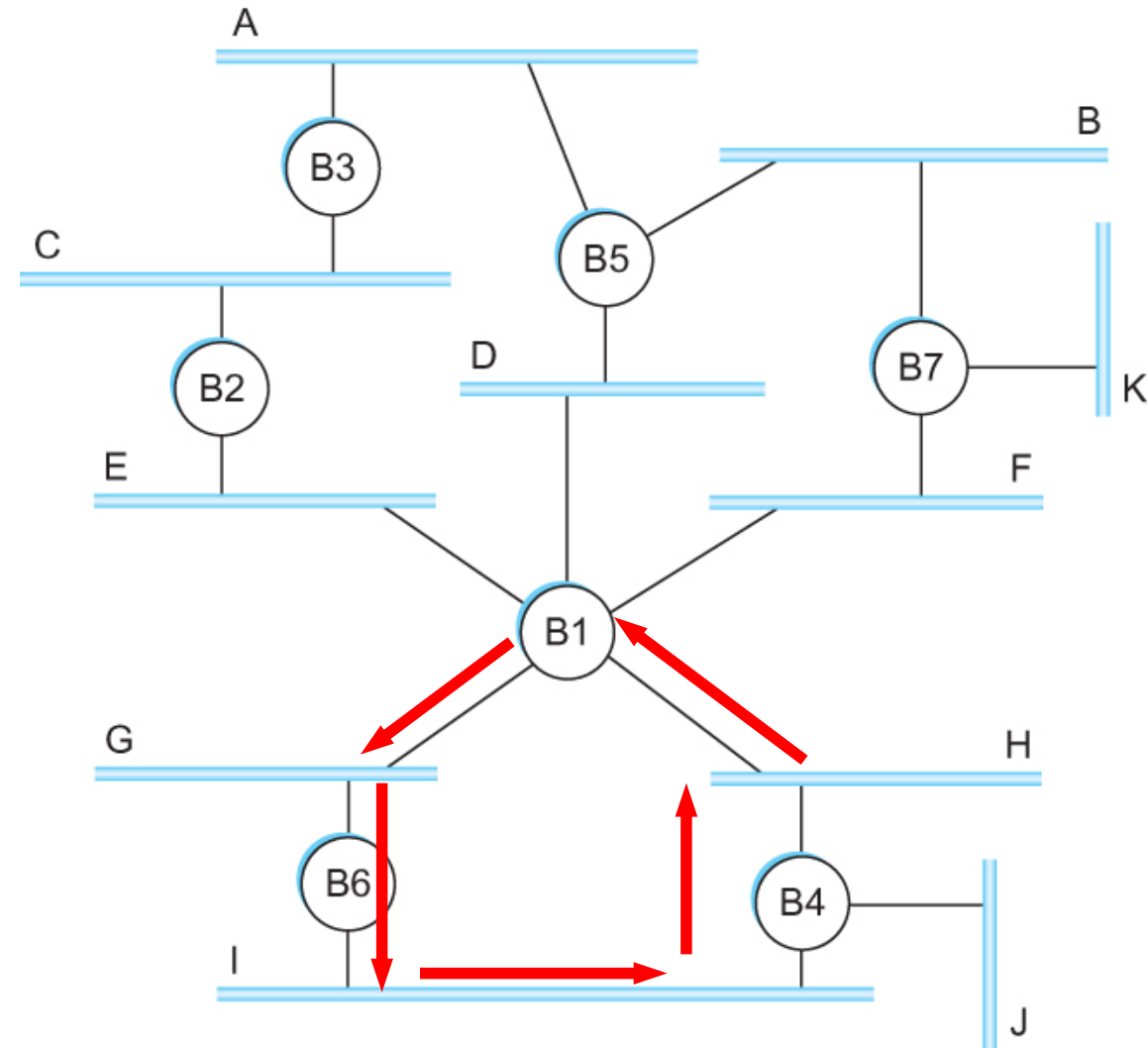
- Bridges and LAN Switches
 - Class of switches that is used to forward packets between shared-media LANs such as Ethernets
 - Known as LAN switches
 - Referred to as Bridges
- Suppose you have a pair of Ethernets that you want to interconnect
 - One approach is put a repeater in between them, physical 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

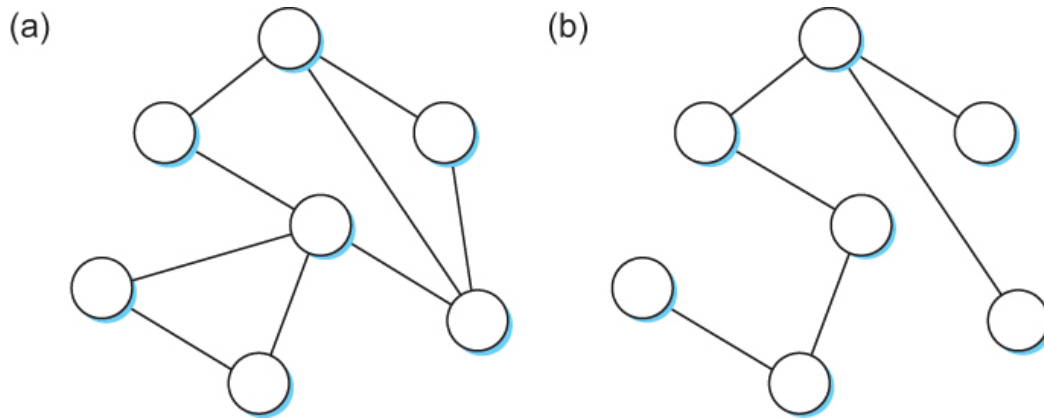


Spot the loop
Why?

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

