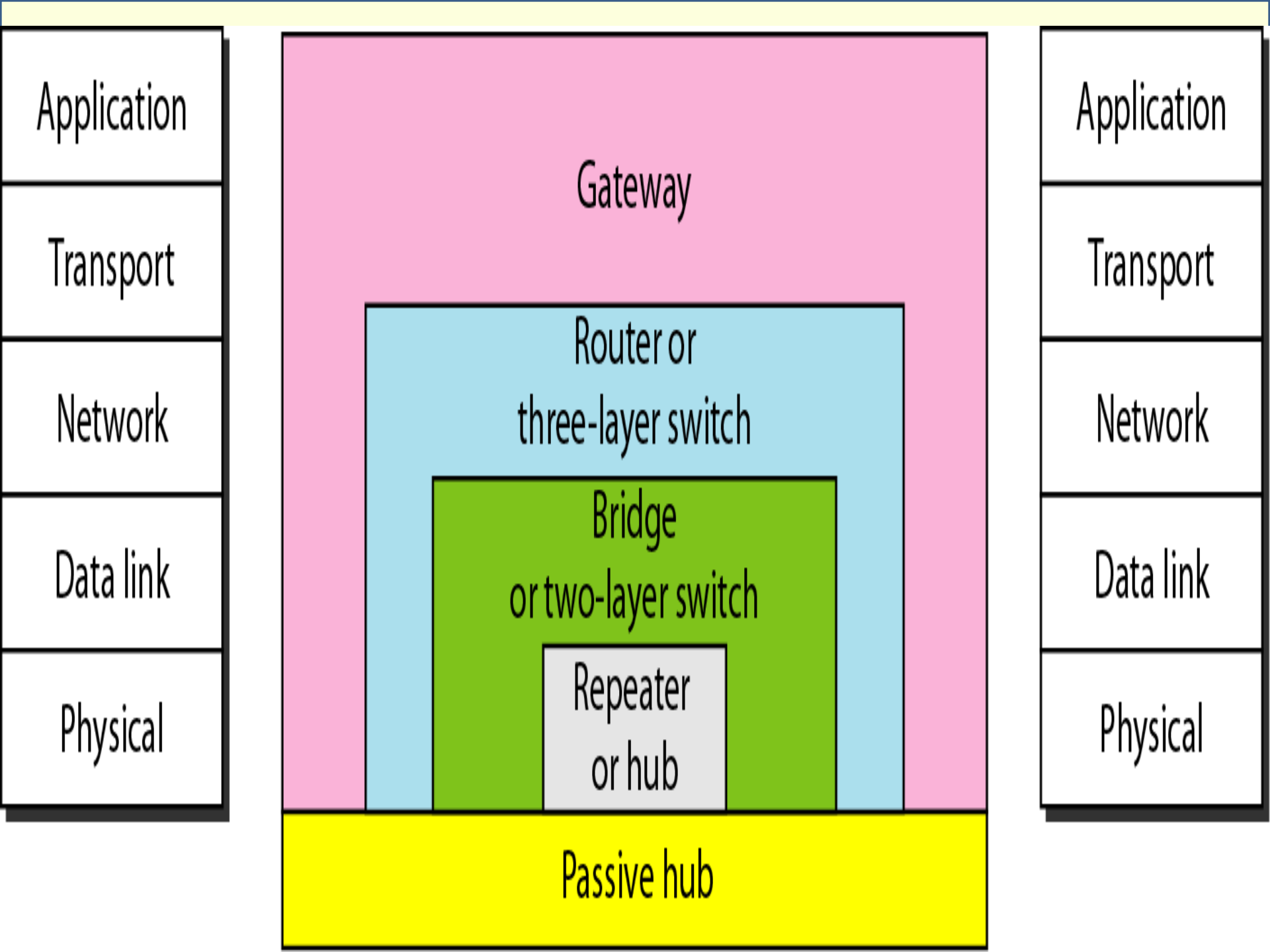
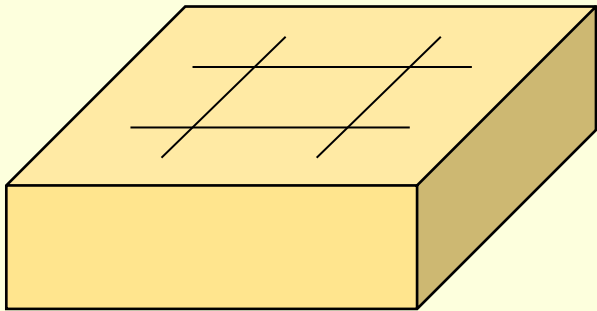
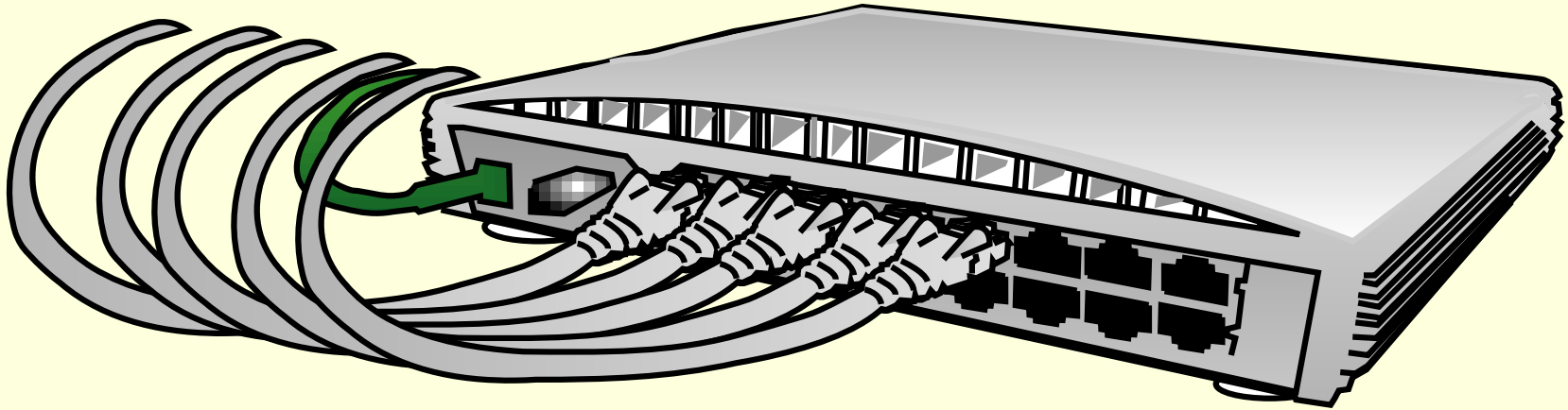


# CONNECTING DEVICES

“LANs do not normally operate in isolation”



# ❖ Hubs

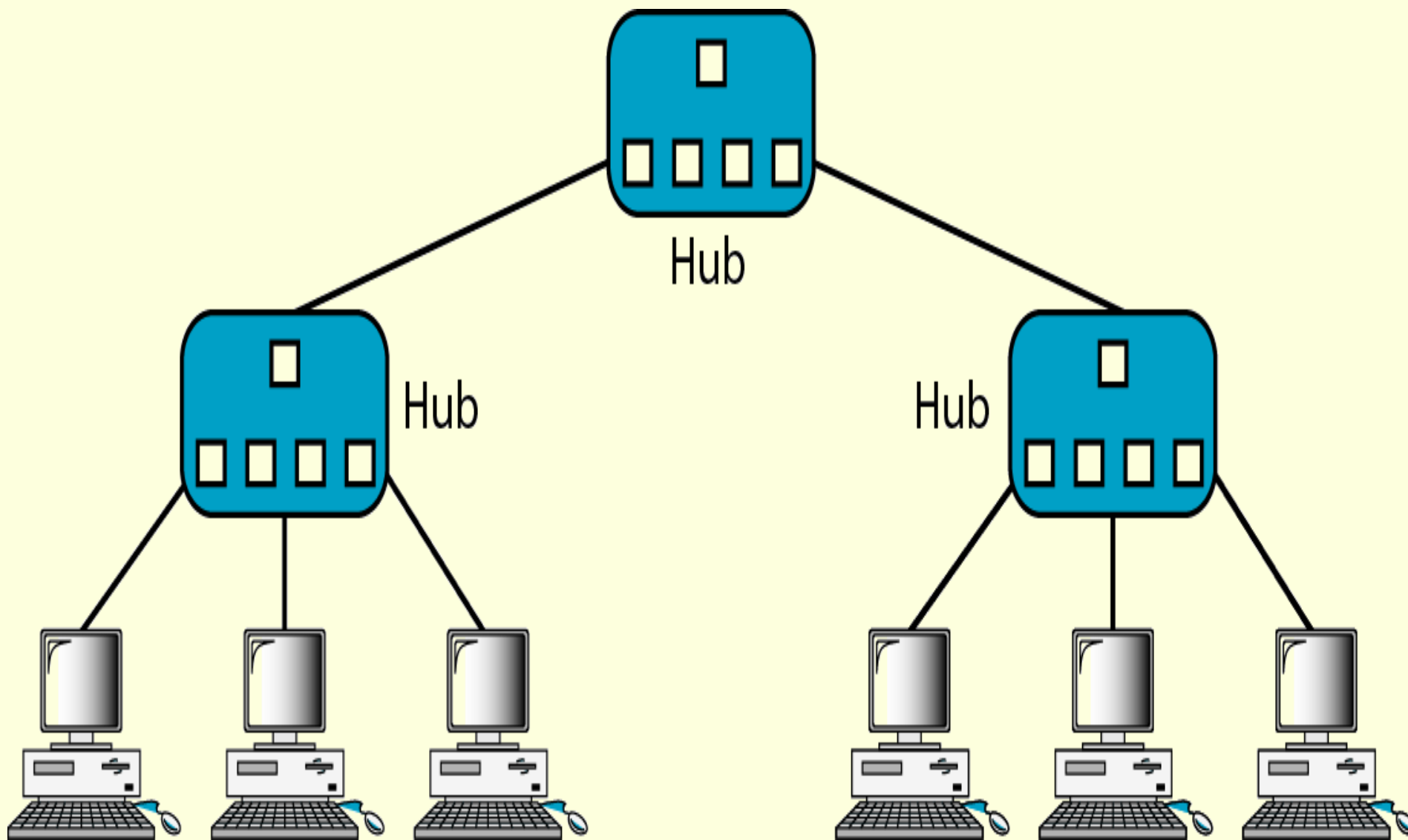


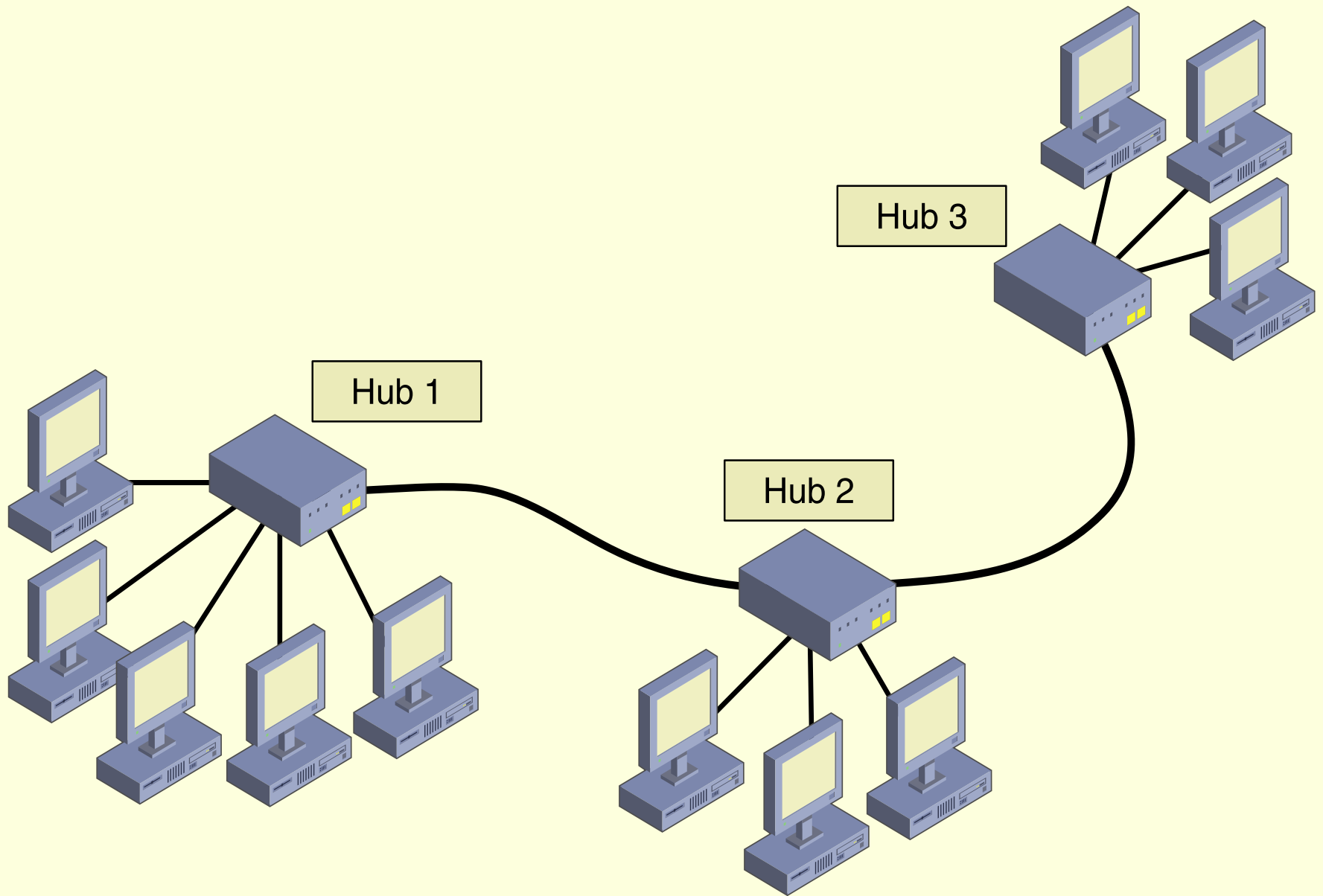
## ❑ Passive Hubs

- Just connector
- Collision point
- Part of the media

## ❑ Active Hubs

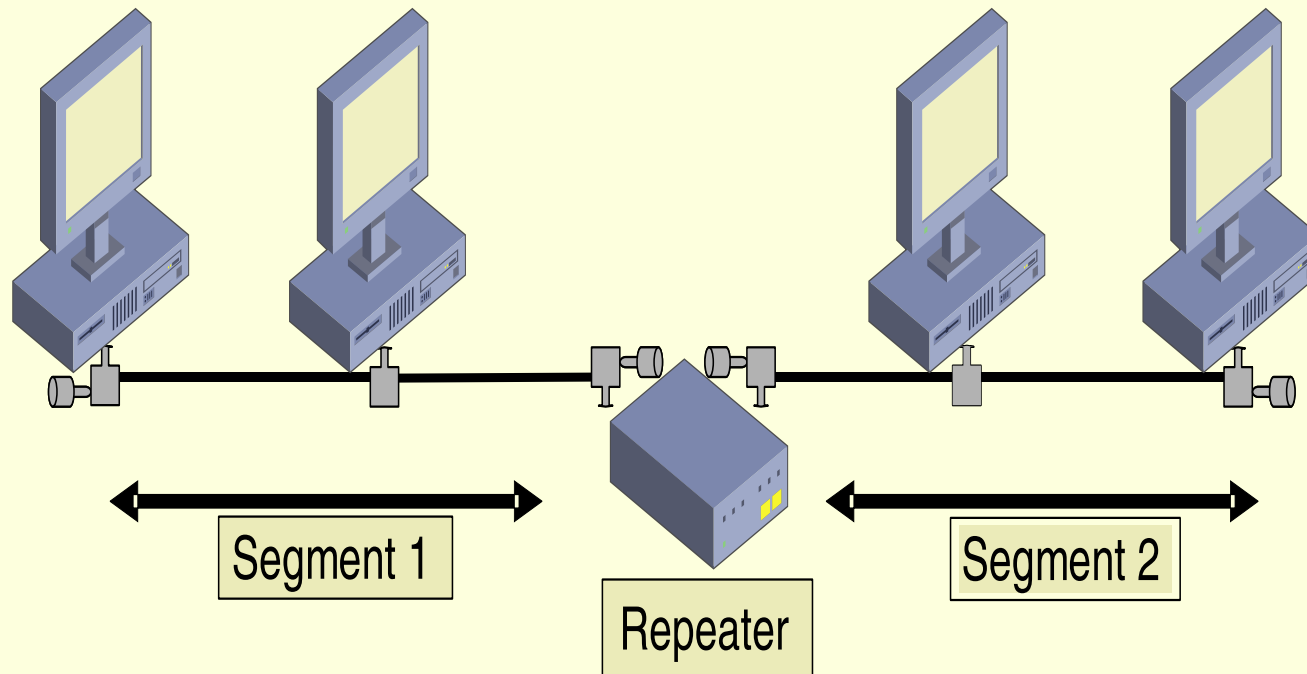
- Multipart repeater
- At physical layer
- 100 m.





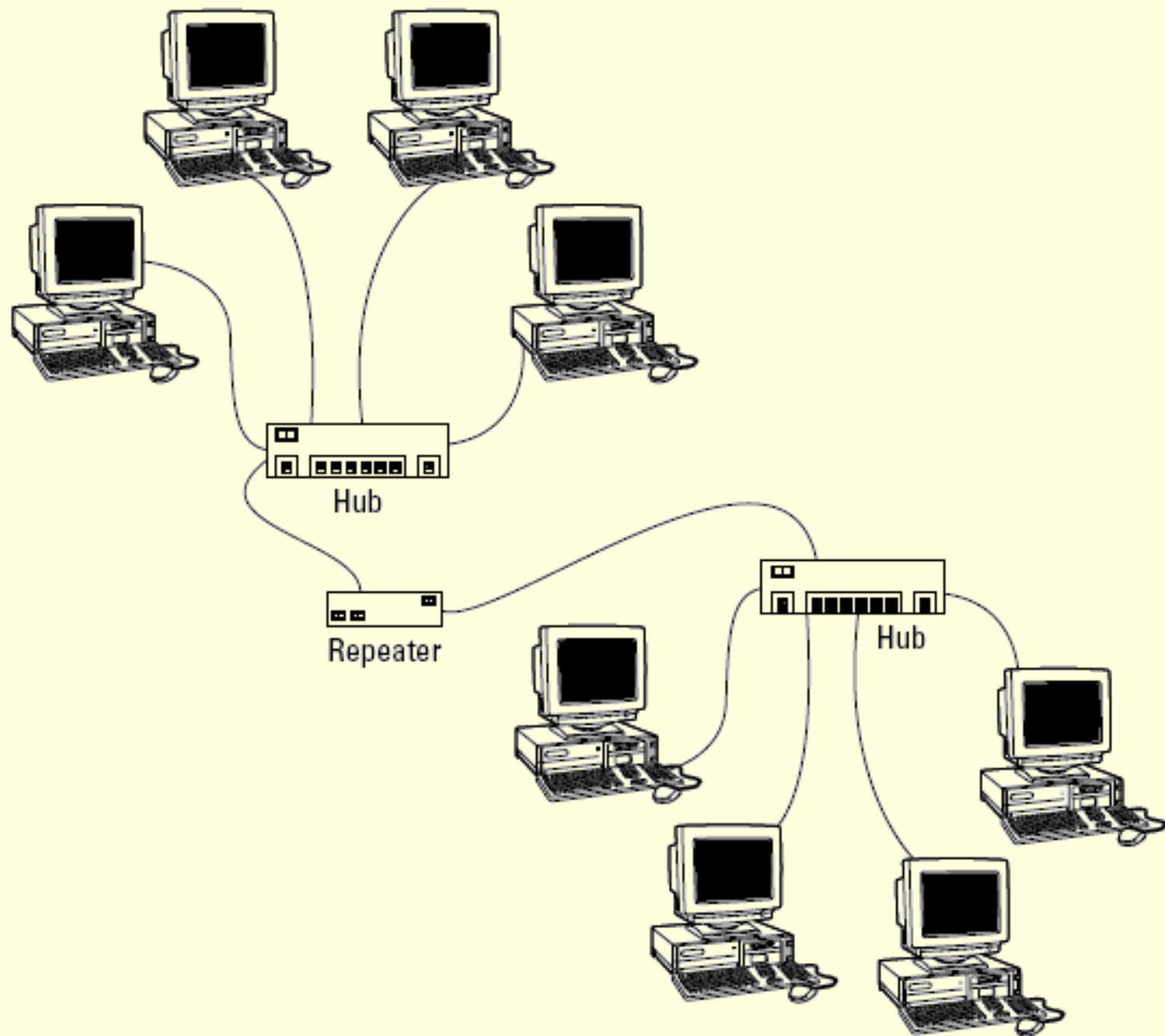
# ❖ Repeaters

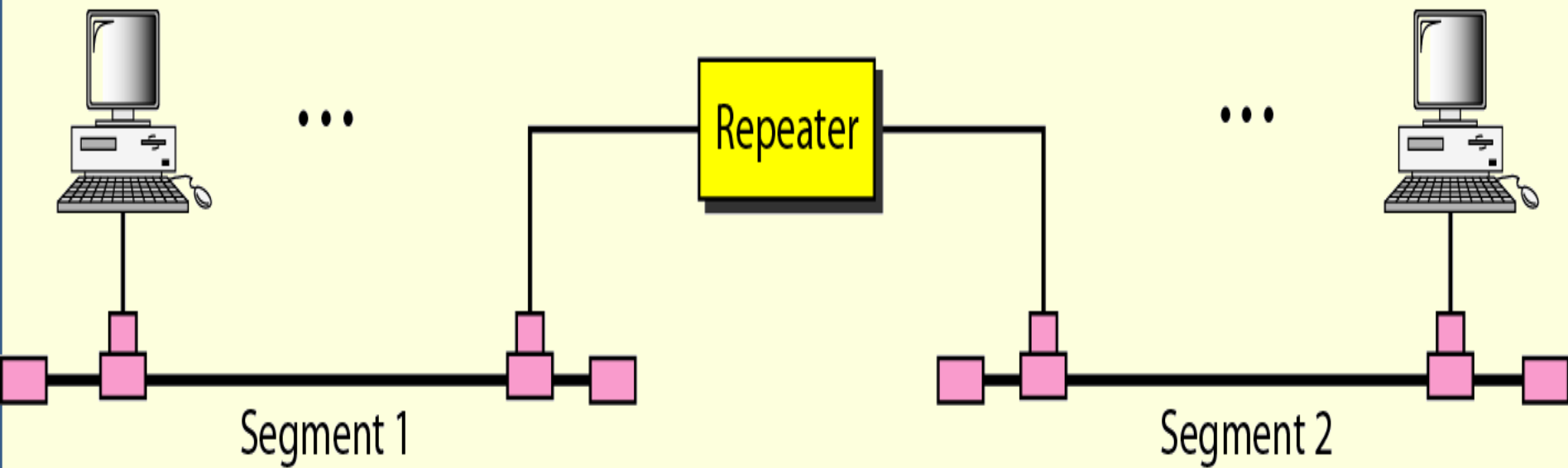
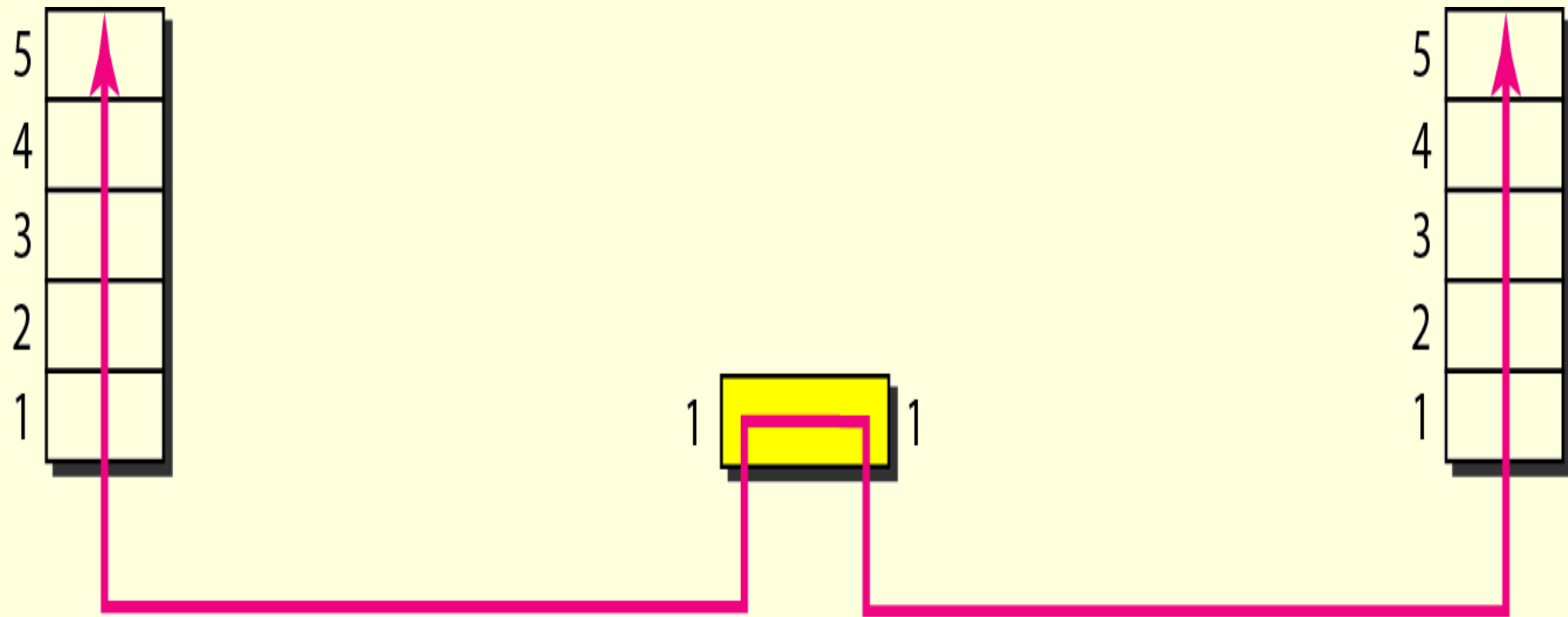
Not a device that can connect two LANs of different protocols



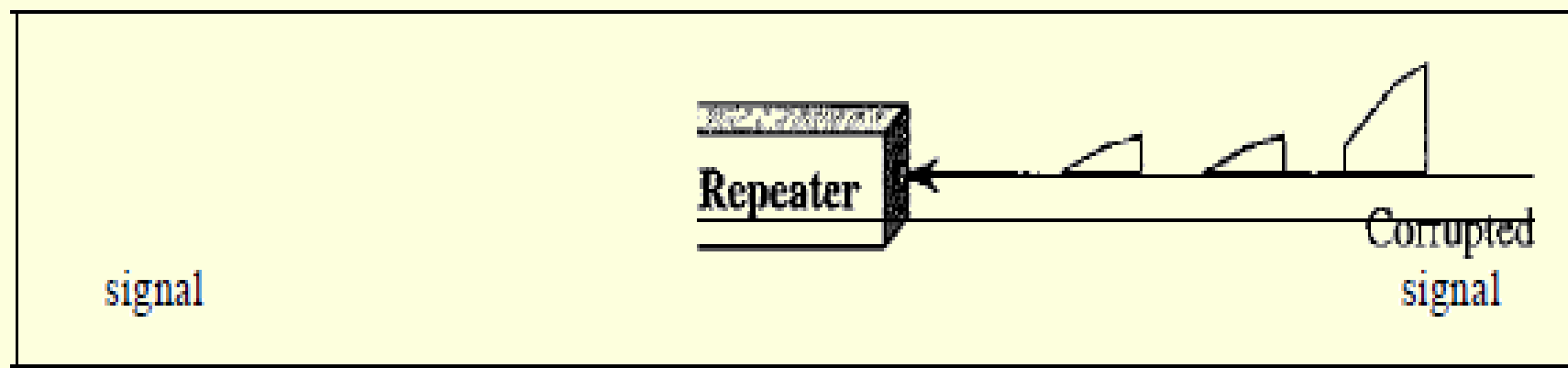
- Operate in the physical layer.
- Regenerate & forward signals.
  - ✓ No filtering capability
- Connect two segments.
  - ✓ Does not actually connect two LANs
- Vital location .
- 500 m.



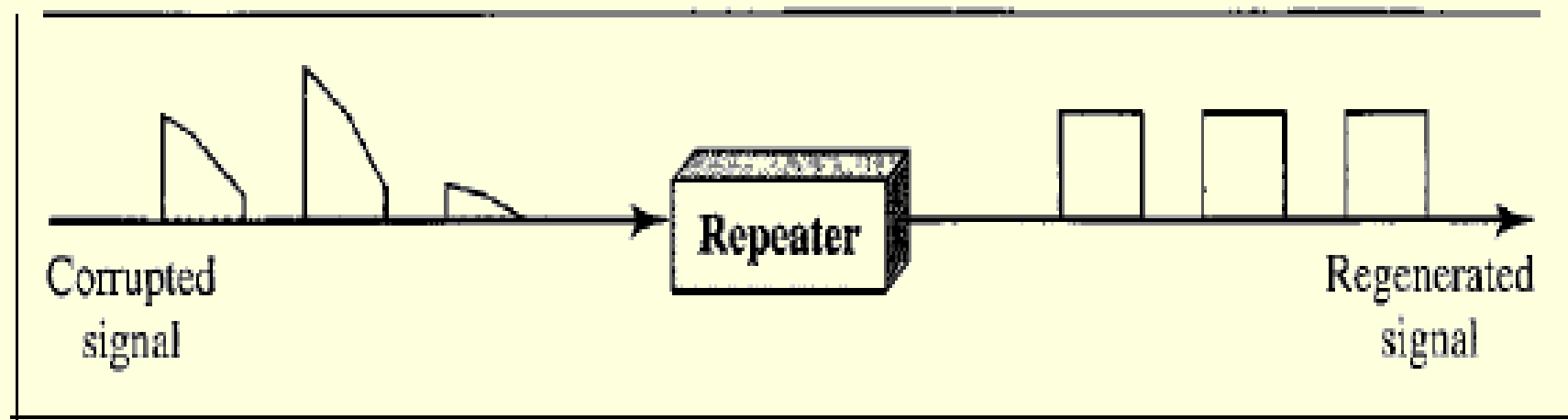




# Function of a repeater

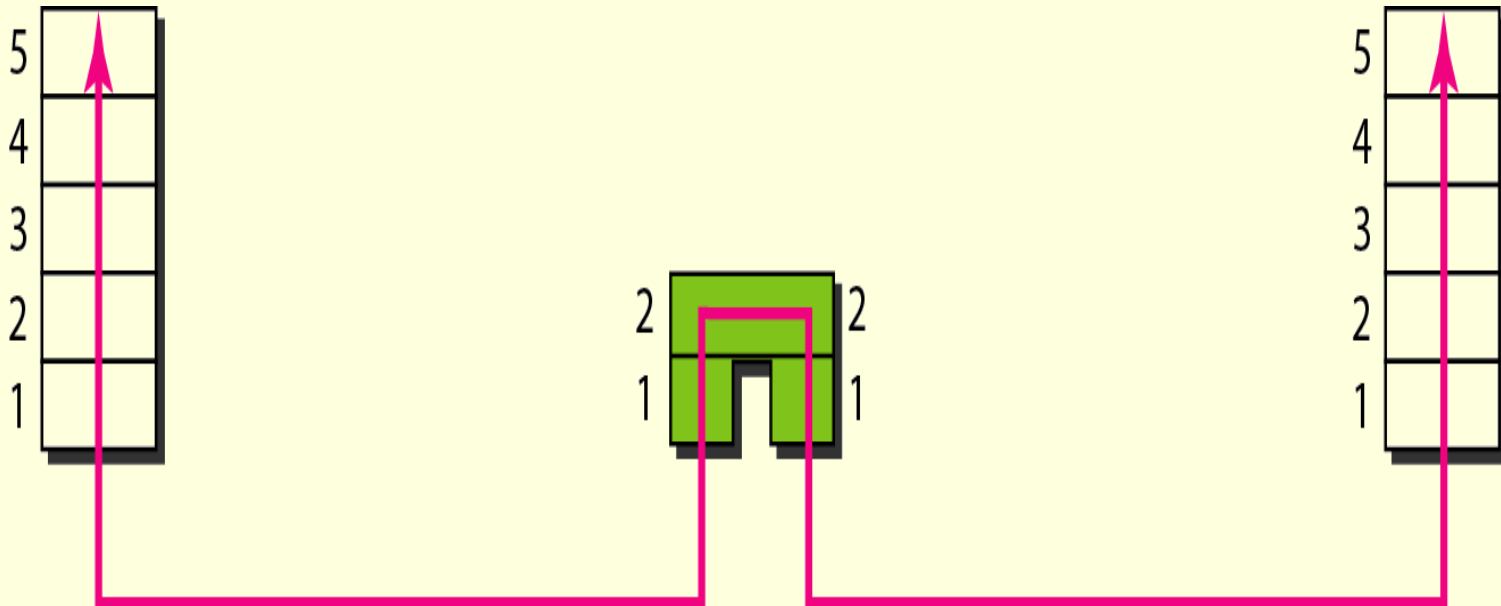


a. Right-to-left transmission.



b. Left-to-right transmission.

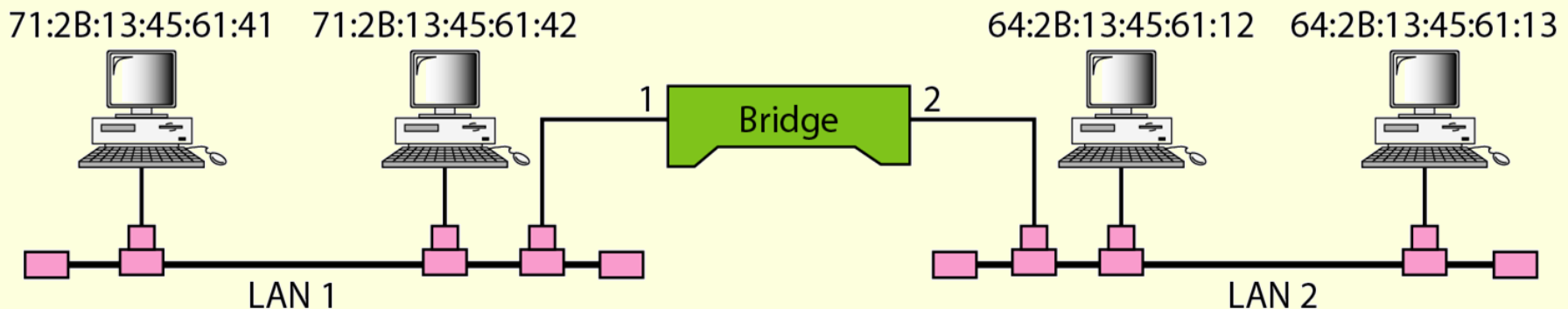
# ❖ Bridges



- Two layers
- Filtering & regenerate
- Not change the physical addresses

Address	Port
71:2B:13:45:61:41	1
71:2B:13:45:61:42	1
64:2B:13:45:61:12	2
64:2B:13:45:61:13	2

Bridge Table



# Transparent Bridges

- Bridge may be added , delete ,reconfiguration & others
- IEEE 802.1 d :transparent bridges must meet three criteria:
  1. Frames must be forwarded from one station to another.
  2. The forwarding table is automatically made by learning frame movements in the network.
  3. Loops in the system must be prevented.

# Learning forward table

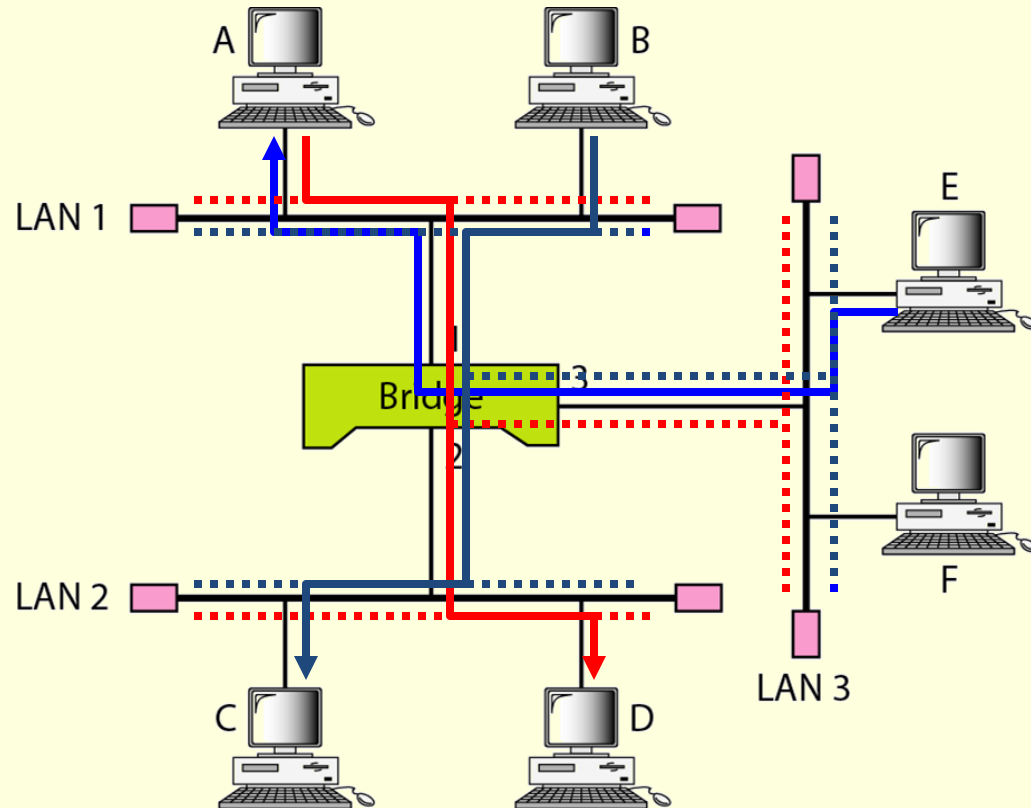
## 1. Static table

- Manual enter each table
- Advantage ?
- Disadvantage ?

## 2. dynamic table

- destination address : forwarding decision
- source address : updating

# Learning Bridges



Address	Port

A → D

Address	Port
A	1

E → A

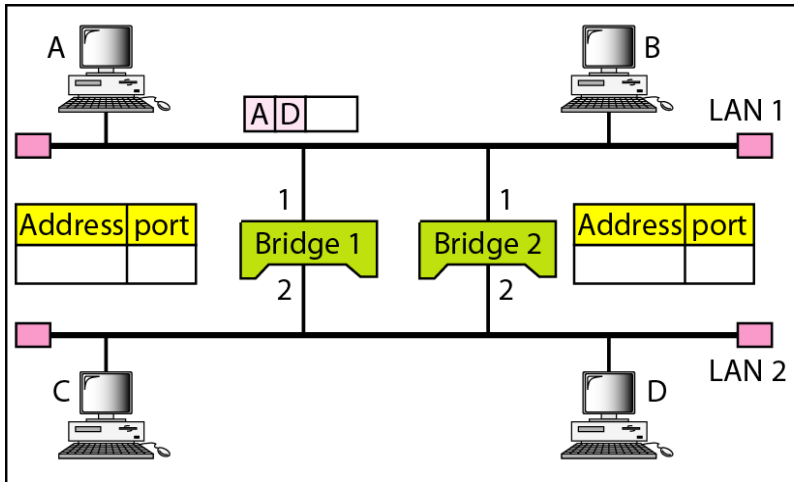
Address	Port
A	1
E	3

B → C

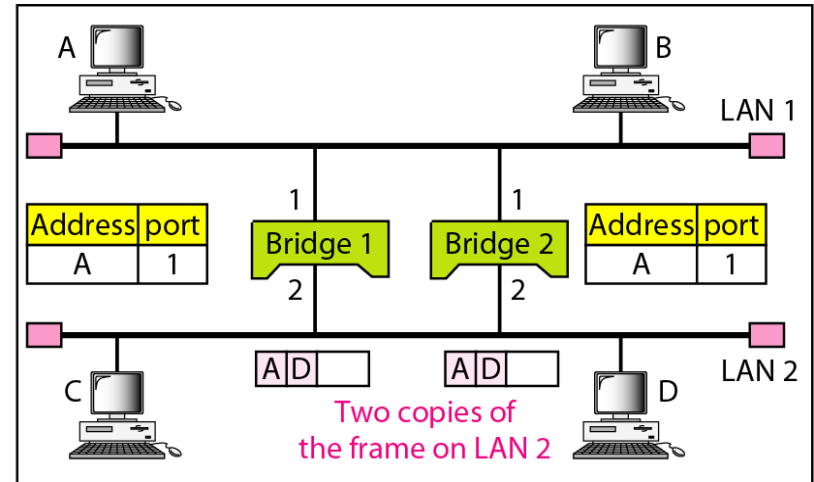
Address	Port
A	1
E	3
B	1



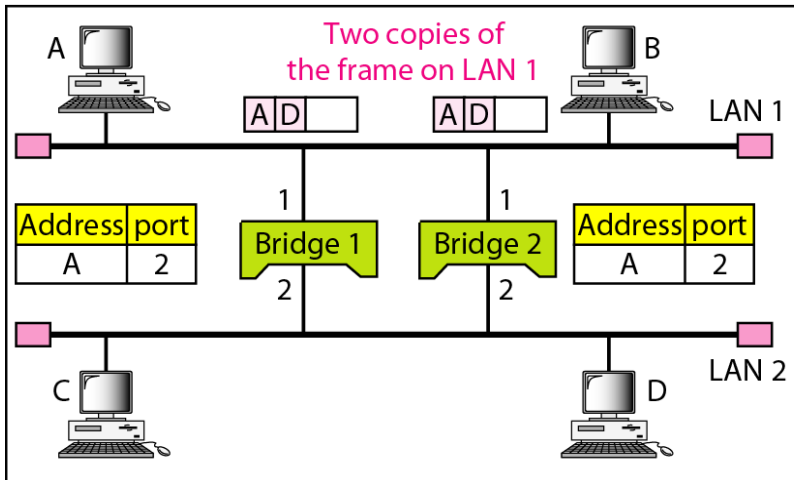
# Loop Problem



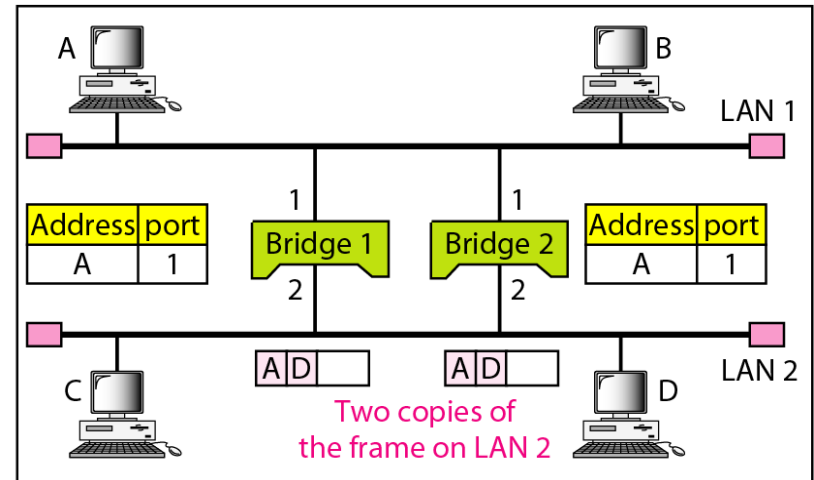
a. Station A sends a frame to station D



b. Both bridges forward the frame



c. Both bridges forward the frame



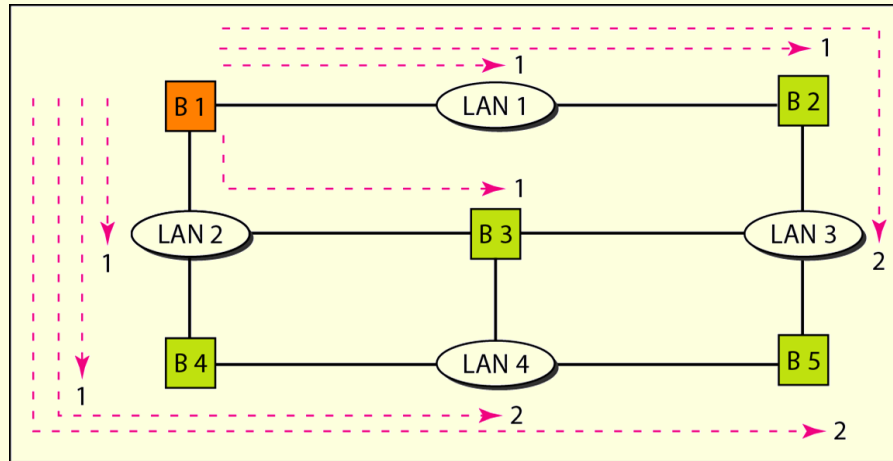
d. Both bridges forward the frame

# Spanning Tree

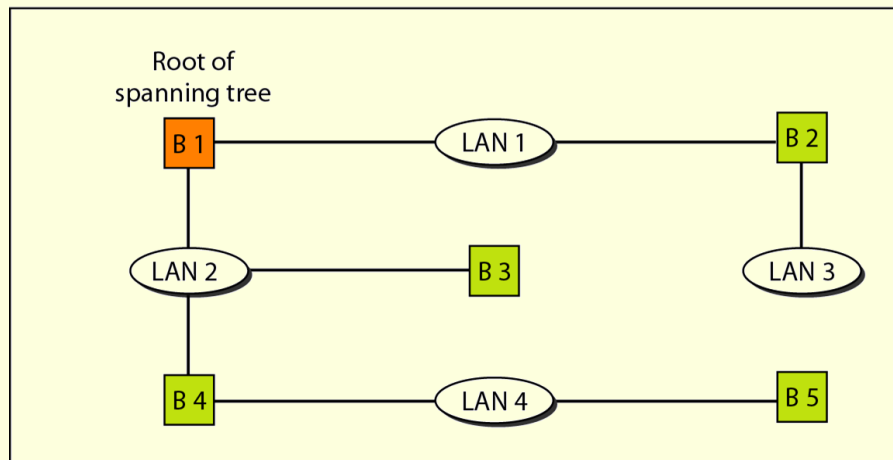
“Logical topology”

- Minimum hops
- Minimum delay
- Maximum bandwidth.
- Security

# Creating Spanning Tree

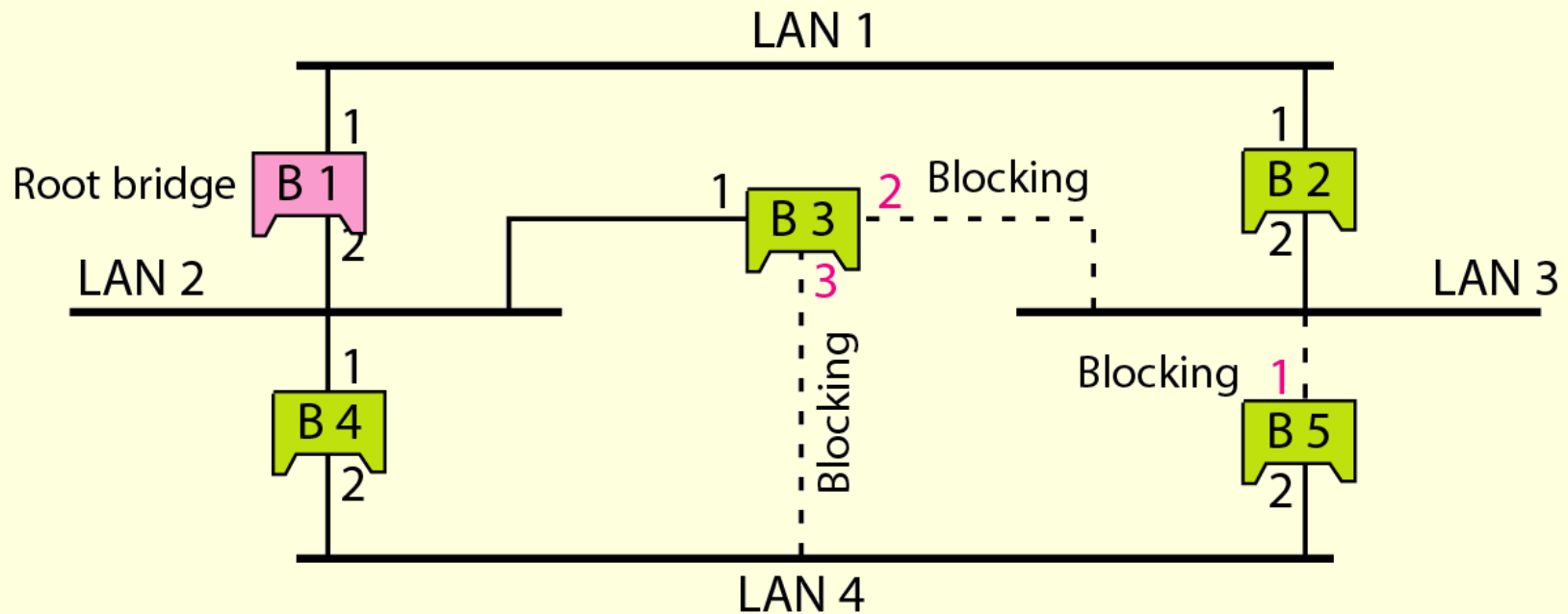


a. Shortest paths



b. Spanning tree

# Blocking Ports



Ports 2 and 3 of bridge B3 are blocking ports (no frame is sent out of these ports).  
Port 1 of bridge B5 is also a blocking port (no frame is sent out of this port).

Dynamic Algorithm  
bridge protocol data units

# Source Routing Bridges

# **Bridges Connecting Different LANs :**

1. Frame format.
2. Maximum data size.
3. Data rate.
4. Bit order
5. Security
6. Multimedia support

# Switches

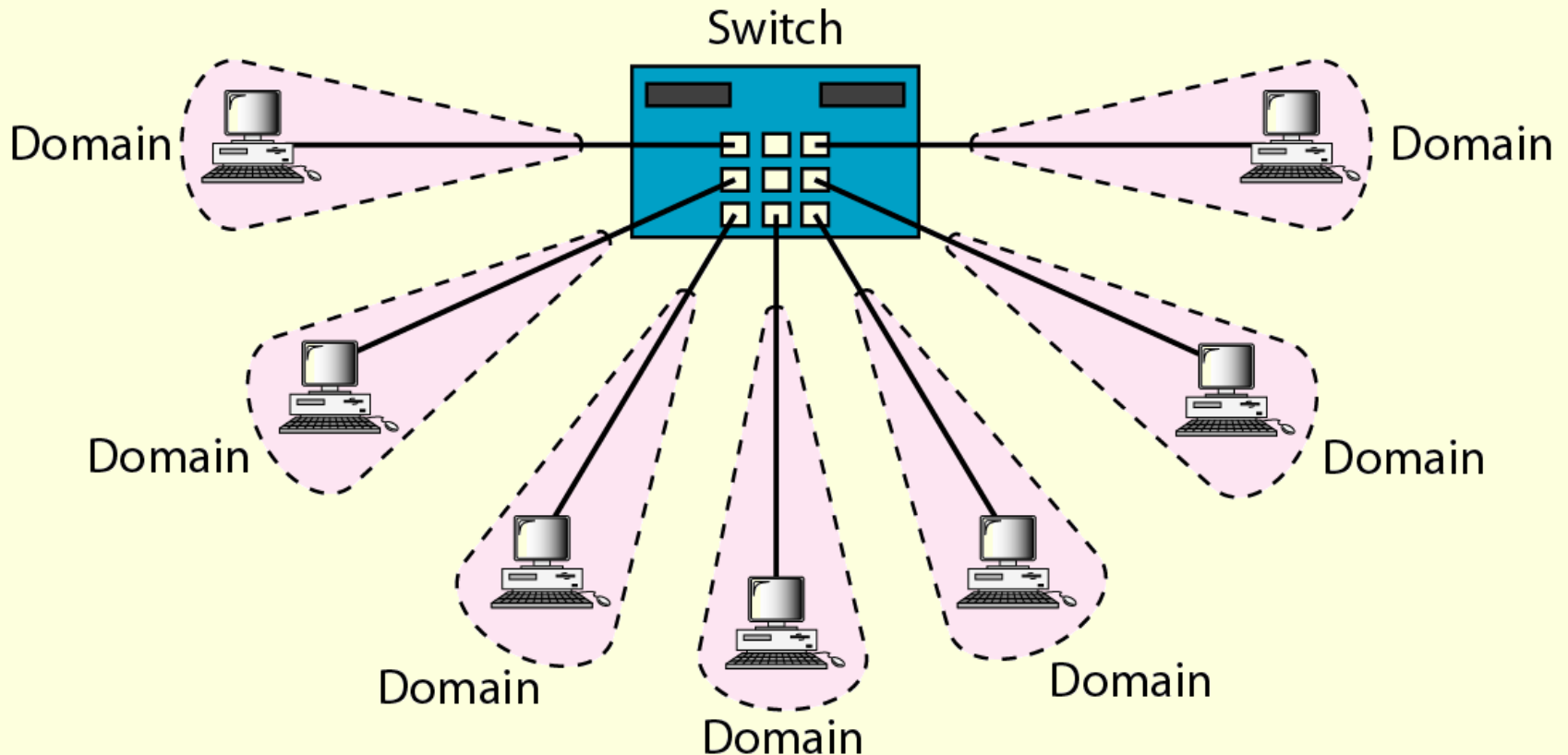
Two layer, three layer



- Establishes a link between the sender and the receiver based on the physical addresses
- Bridge with many ports & faster
- No competing traffic
- It can have a buffer
- Cut-through

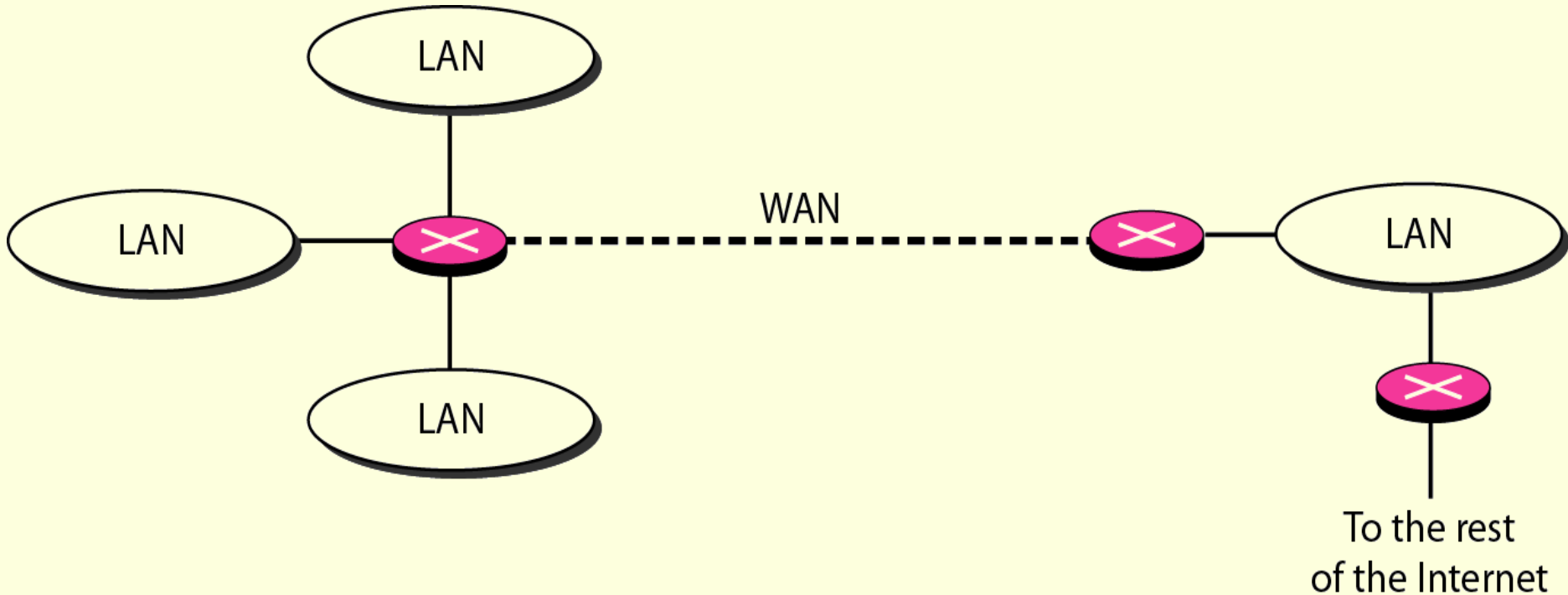
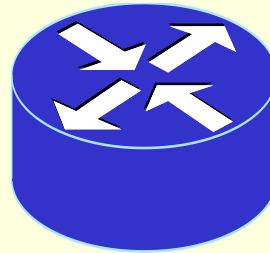
# Switches

- Similar to multiport bridges
- Also run Spanning-Tree Protocol



Three-Layer Switches  
faster and more sophisticated

# Routers

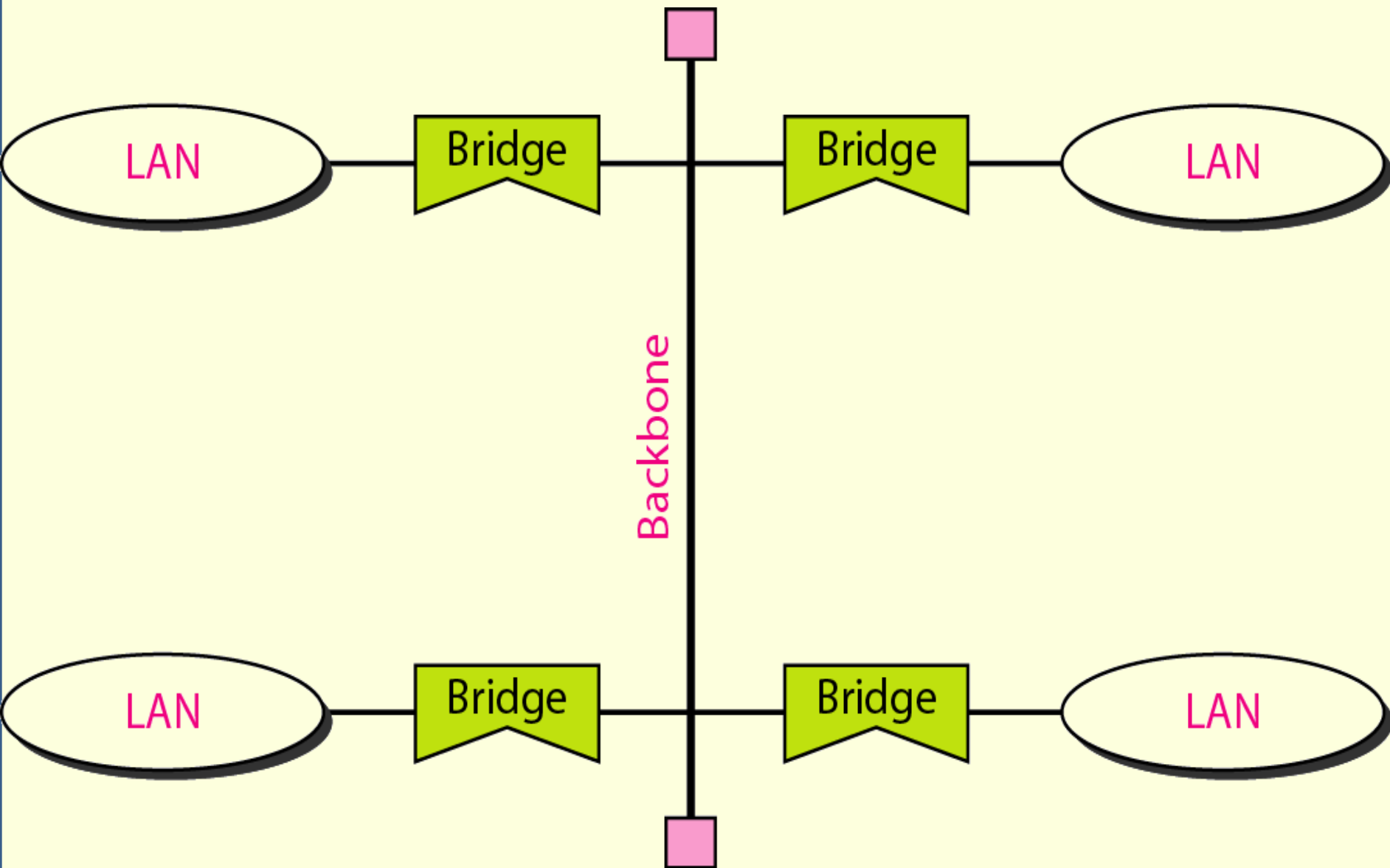


# Gateway

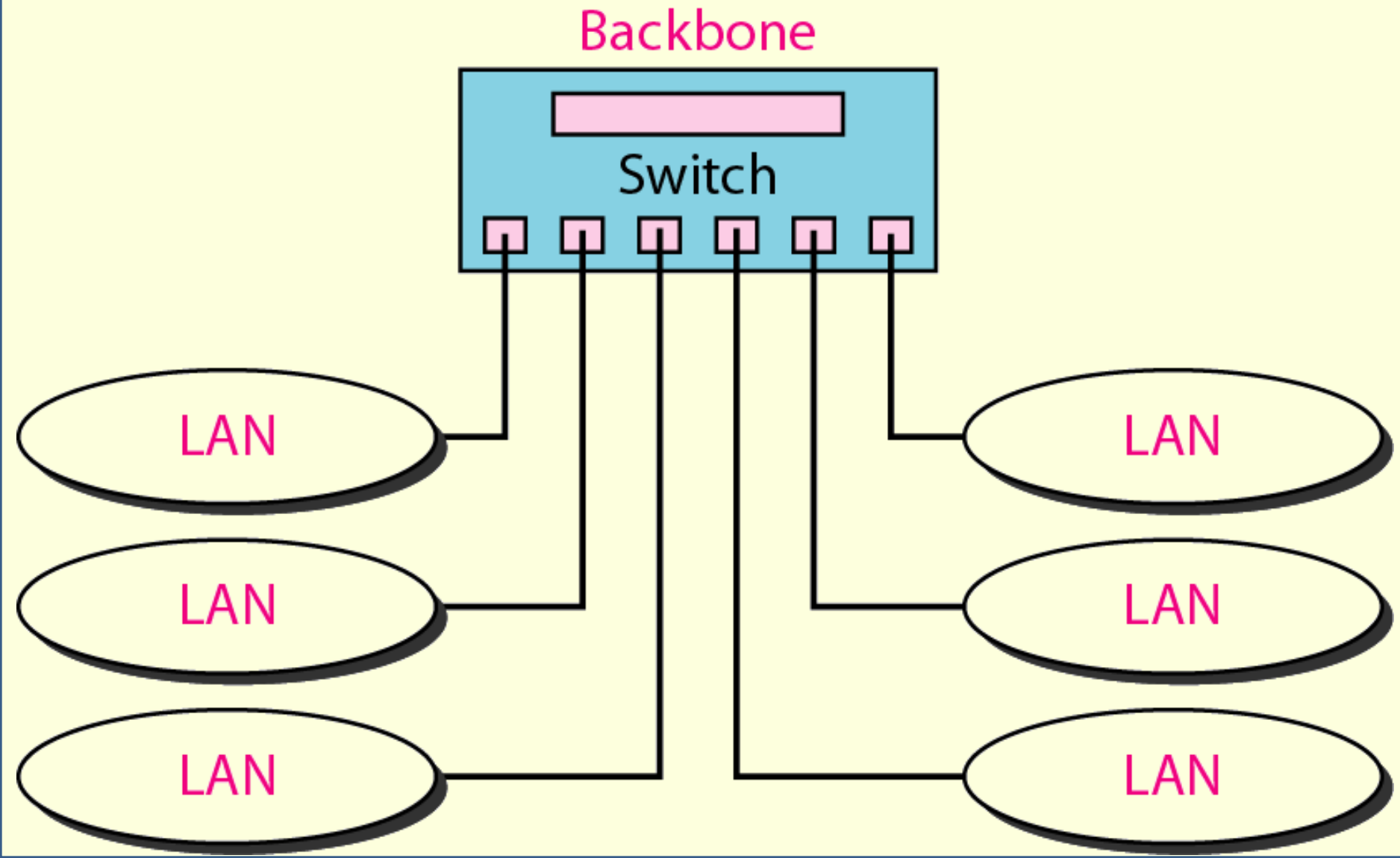
Take a message , read it & interprets it

# BACKBONE NETWORKS

# *Bus backbone*

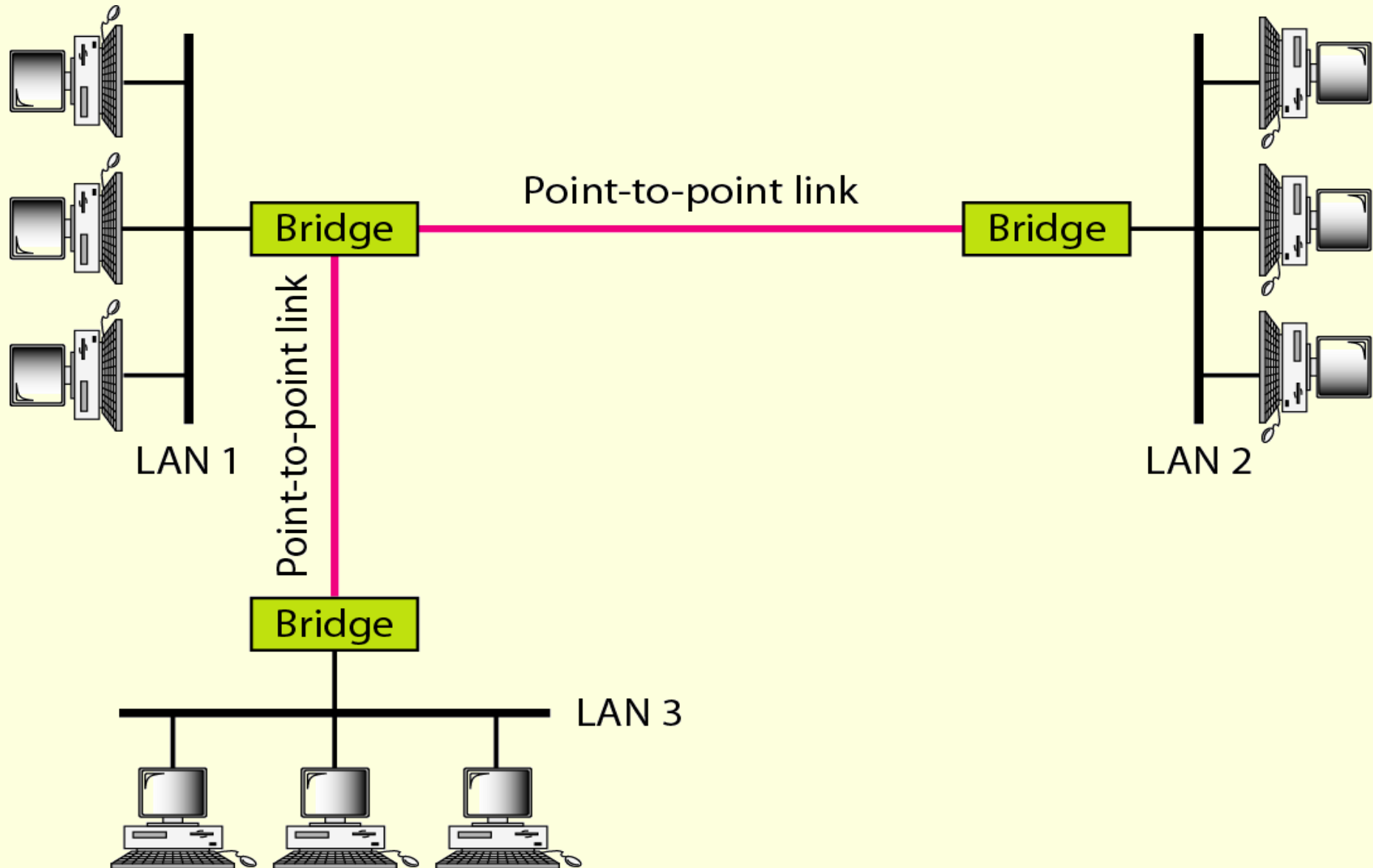


# Star backbone(collapsed)



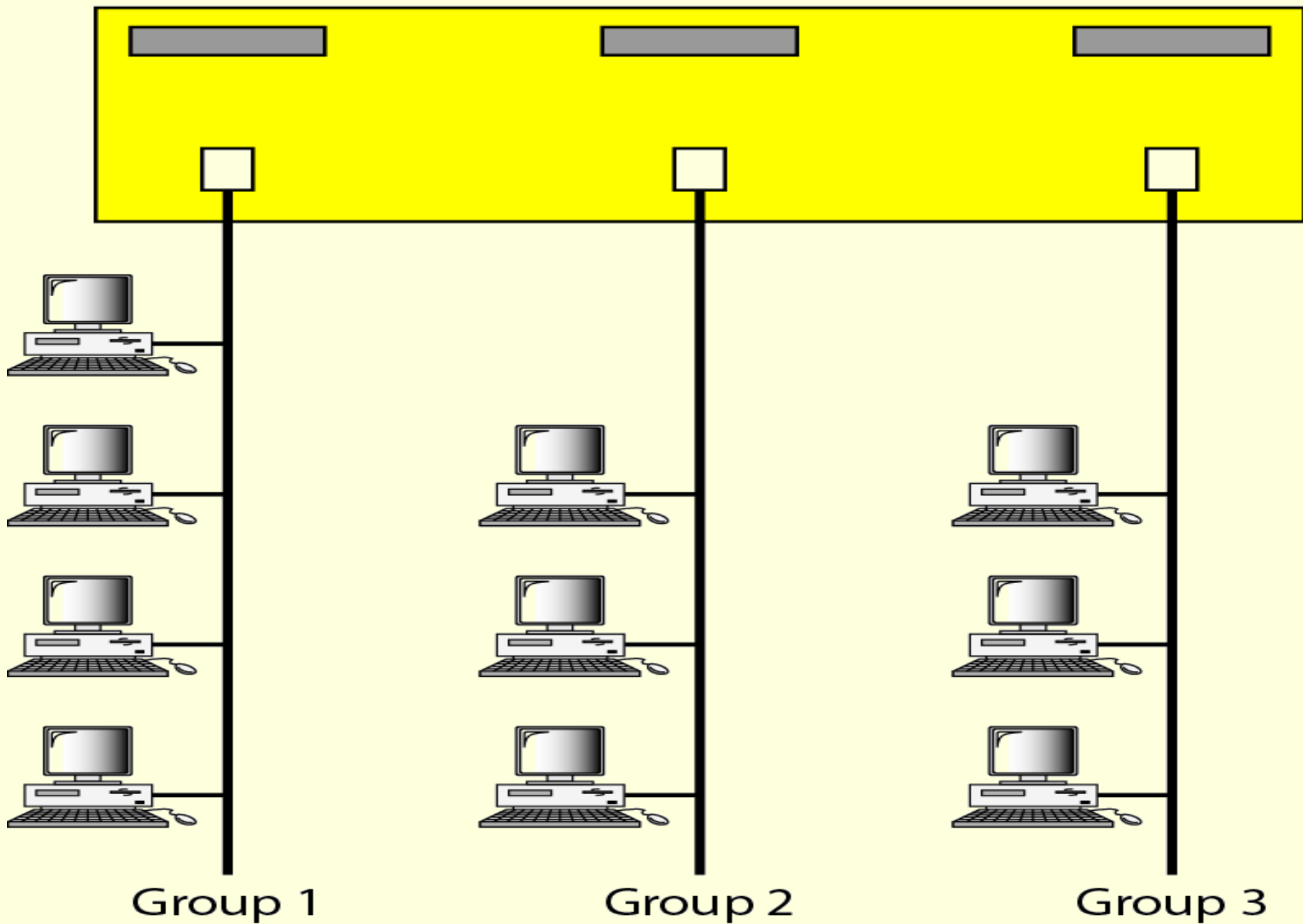


## *Connecting remote LANs with bridges*

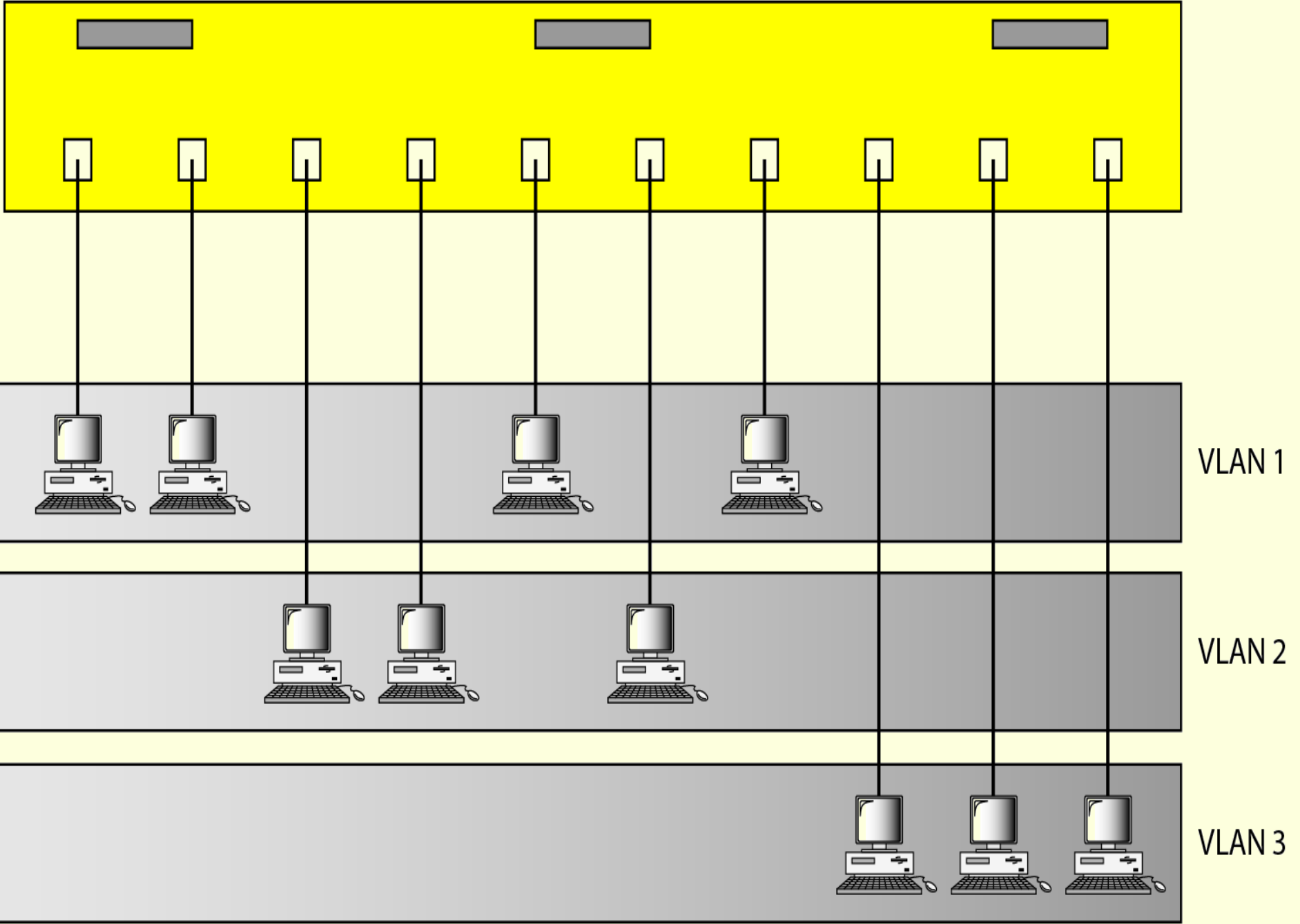


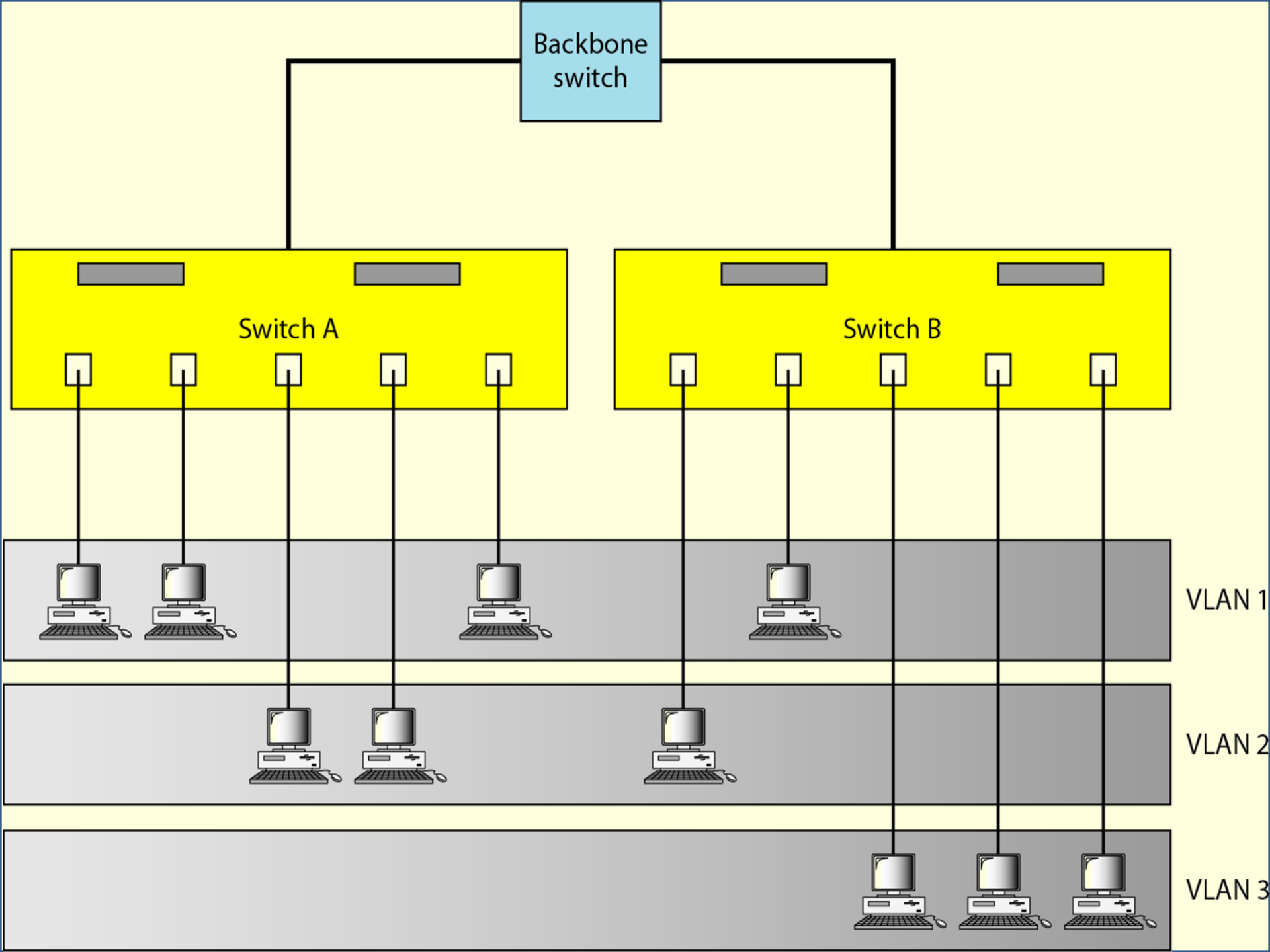
# **VIRTUAL LANs**

# Switch



Switch with VLAN software





# Configuration

- Manual Configuration
  - ✓ Port numbers
  - ✓ IP
- Automatic Configuration
  - ✓ According to criteria
- Semiautomatic Configuration

# Advantages

- *Cost and Time Reduction*
- *Creating Virtual Work Groups*
- *Security*