Data Communication & Computer Networks

6. Connecting Networks

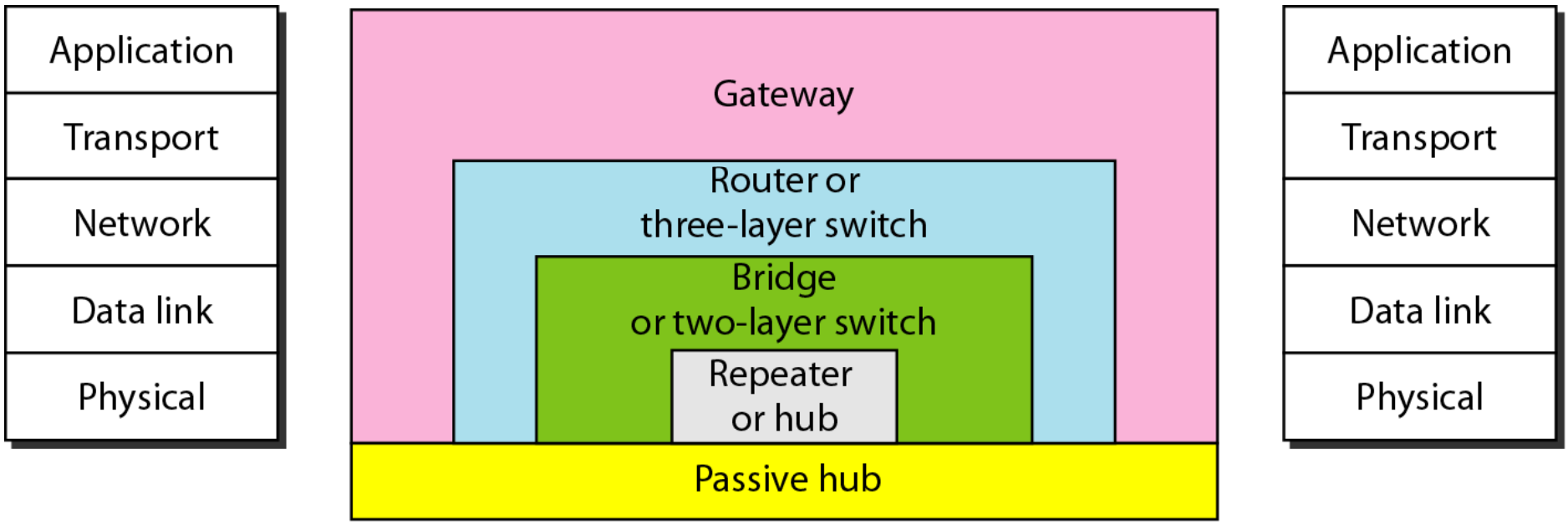
Connecting Devices

- A local area network (LAN) is a computer network that is designed for a limited geographic area such as a building or a campus.
- LANs do not normally operate in isolation, they are connected to one another or to the Internet.
- To connect LANs, or segments of LANs, we use connecting devices.

5 Categories of connecting devices

1. Those which operate below the physical layer such as a passive hub.
2. Those which operate at the physical layer (a repeater or an active hub).
3. Those which operate at the physical and data link layers (a bridge or a two-layer switch).
4. Those which operate at the physical, data link, and network layers (a router or a three-layer switch).
5. Those which can operate at all five layers (a gateway).

5 Categories of connecting devices



Passive hub

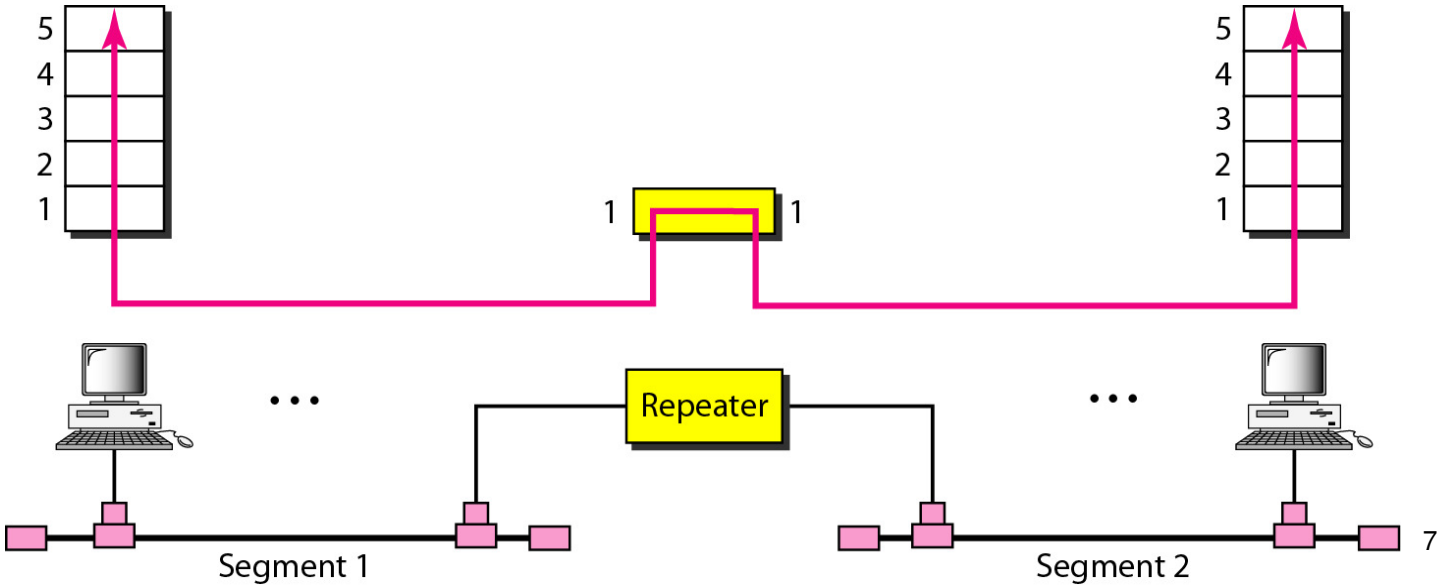
- A passive hub is just a connector, it connects the wires coming from different branches.
- In a star-topology Ethernet LAN, a passive hub is just a point where the signals coming from different stations collide; the hub is the collision point.
- This type of a hub is part of the media; its location in the Internet model is below the physical layer.

Repeater

- A repeater is a device that operates only in the physical layer.
- Signals carrying information can travel a fixed distance before attenuation.
- A repeater receives a signal and, before it becomes too weak or corrupted, regenerates the original bit pattern.
- The repeater then sends the refreshed signal.

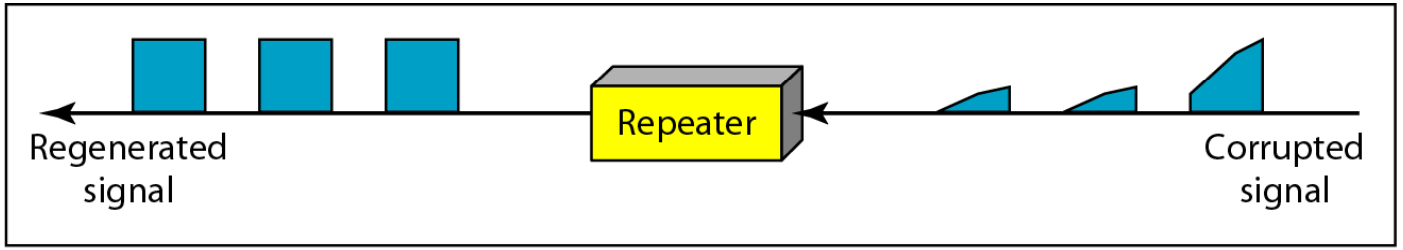
Repeater

- A repeater does not actually connect two LANs; it connects two segments of the same LAN
- A repeater forwards every frame; it has no filtering capability.

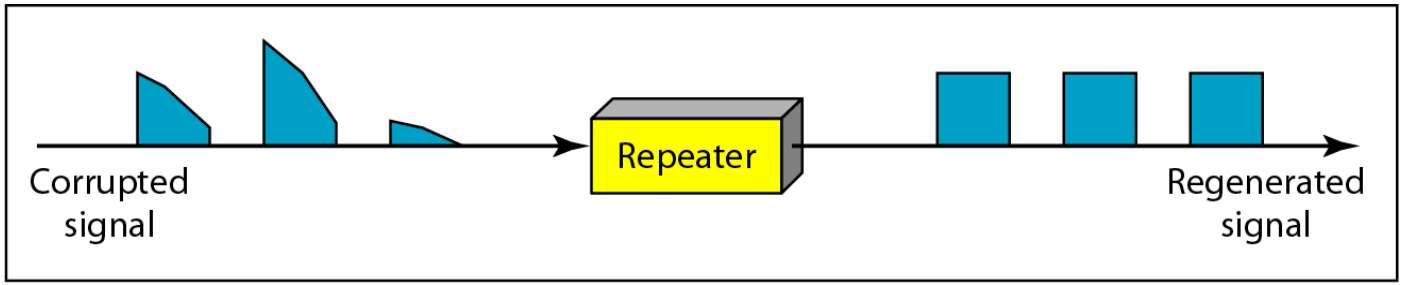


Repeater

- A repeater is a regenerator, not an amplifier.



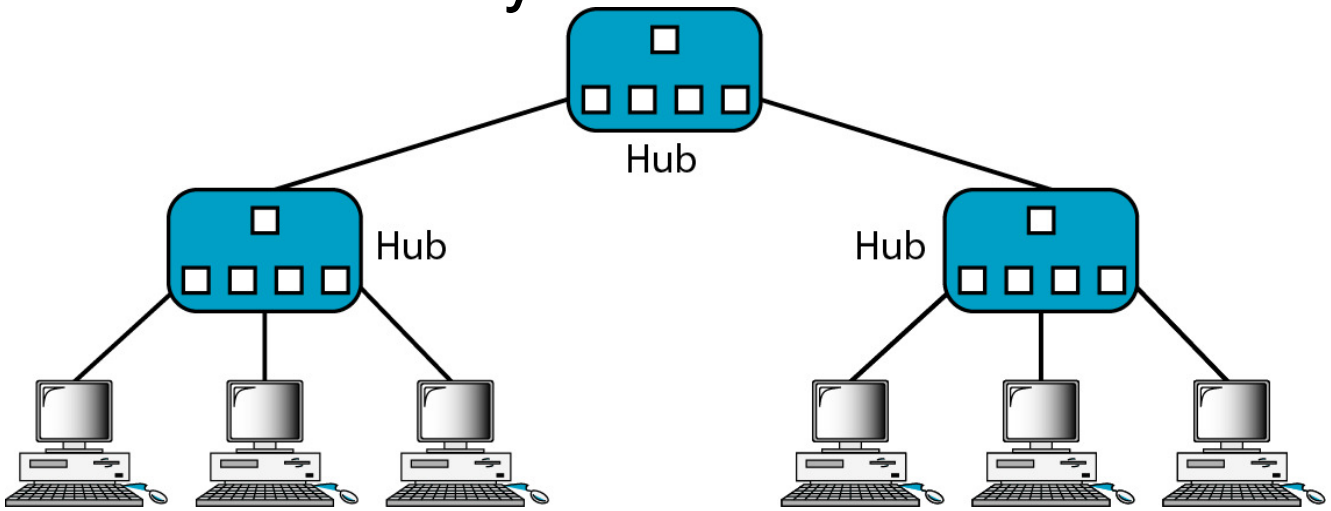
a. Right-to-left transmission.



b. Left-to-right transmission.

Active Hubs

- An active hub is actually a multipart repeater.
- It is normally used to create connections between stations in a physical star topology.
- Hubs can also be used to create multiple levels of hierarchy.

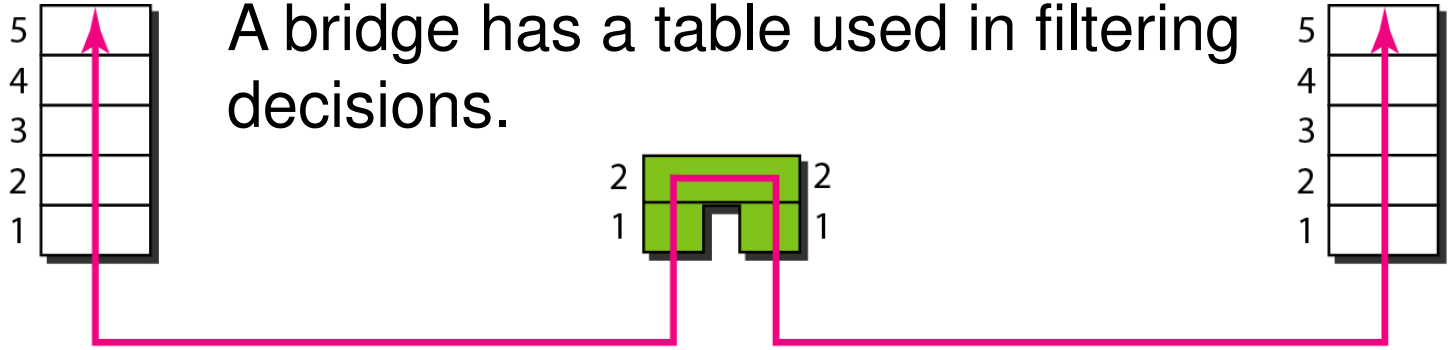


Bridges

- A bridge operates in both the physical and the data link layer.
- As a physical layer device, it regenerates the signal it receives.
- As a data link layer device, the bridge can check the physical (MAC) addresses (src and dest) contained in the frame.

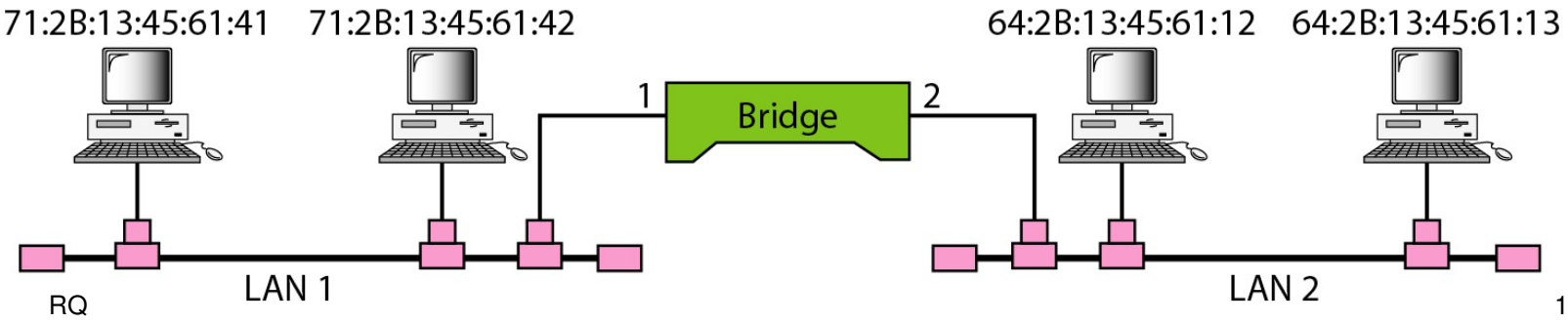
Bridge

A bridge has a table used in filtering decisions.



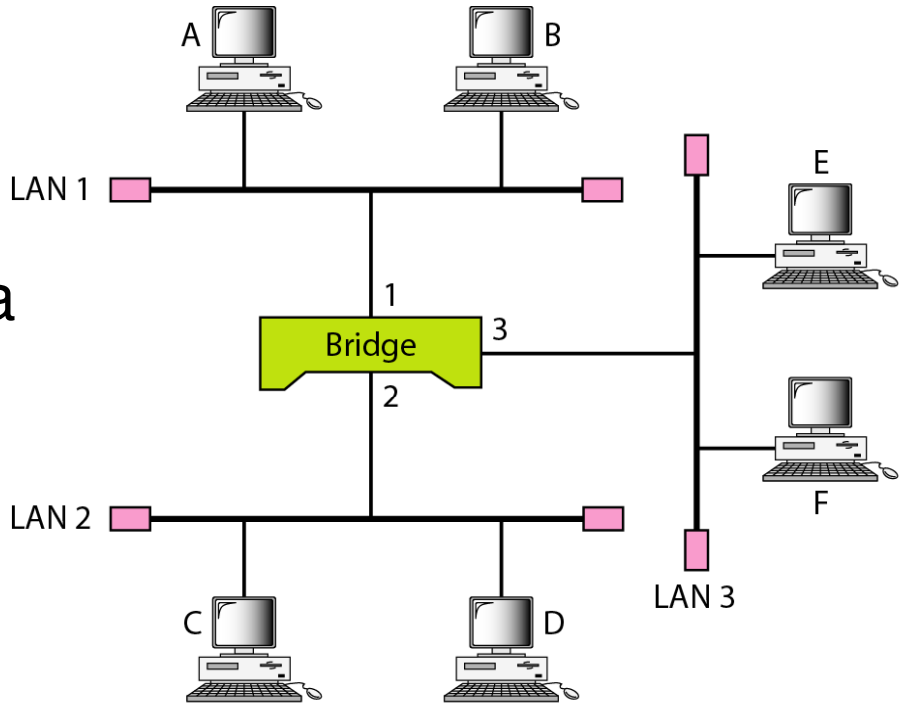
Address	Port
71:2B:13:45:61:41	1
71:2B:13:45:61:42	1
64:2B:13:45:61:12	2
64:2B:13:45:61:13	2

Bridge Table



Bridge – Learning Process

A bridge does not change the physical (MAC) addresses in a frame.



Address	Port

a. Original

Address	Port
A	1

b. After A sends a frame to D

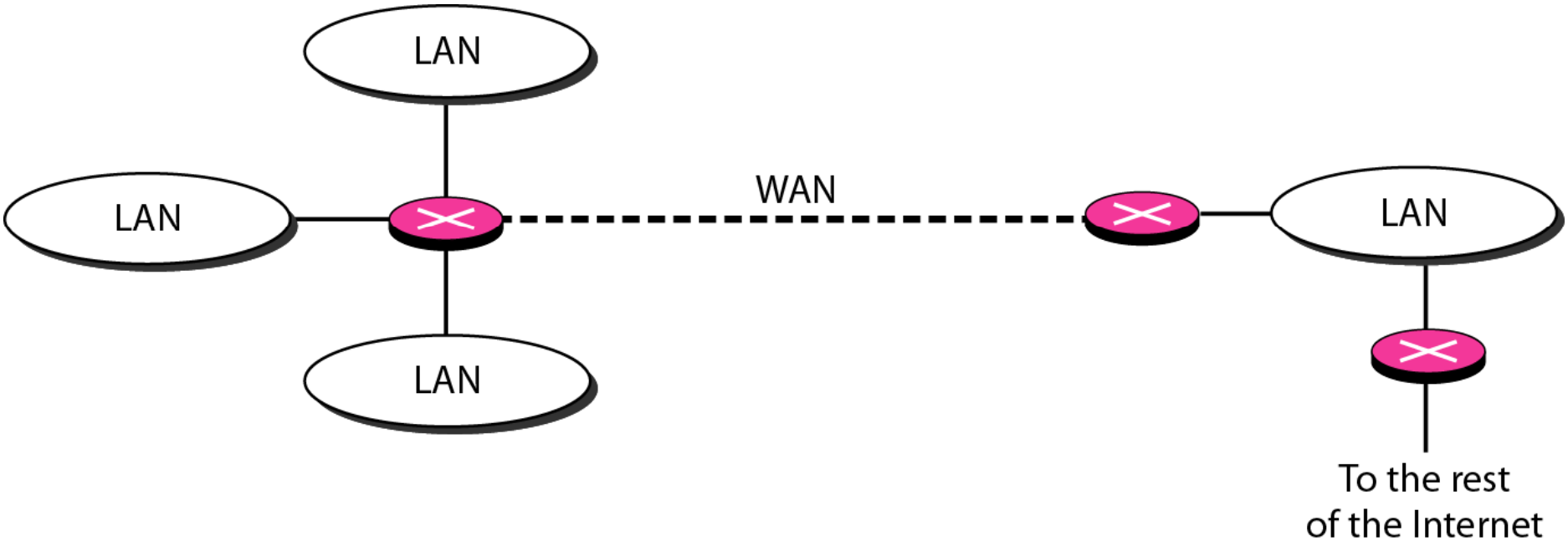
Address	Port
A	1
E	3

c. After E sends a frame to A

Address	Port
A	1
E	3
B	1

d. After B sends a frame to C

Routers

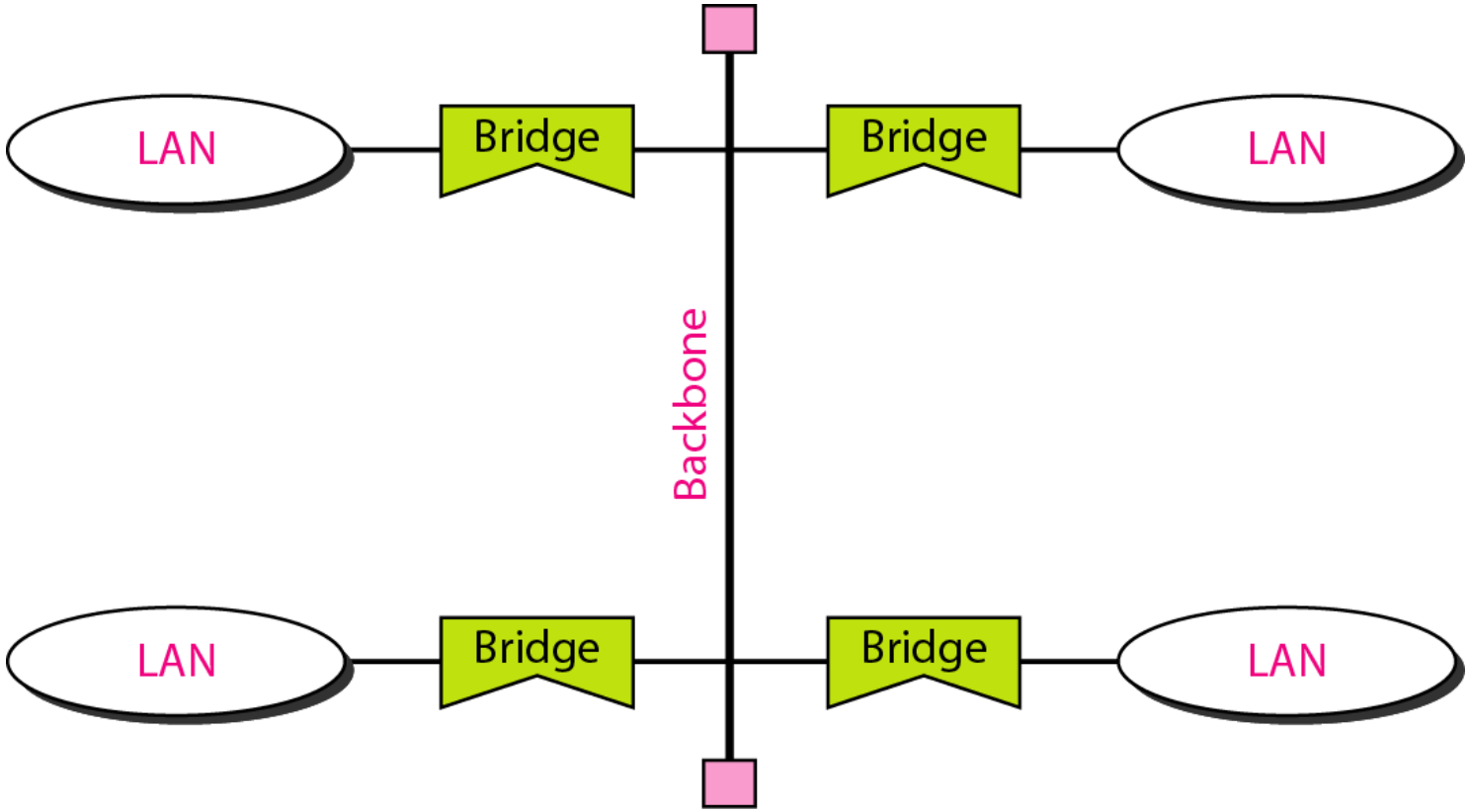


Backbone networks

- A backbone network allows several LANs to be connected.
- In a backbone network, no station is directly connected to the backbone; the stations are part of a LAN, and the backbone connects the LANs.

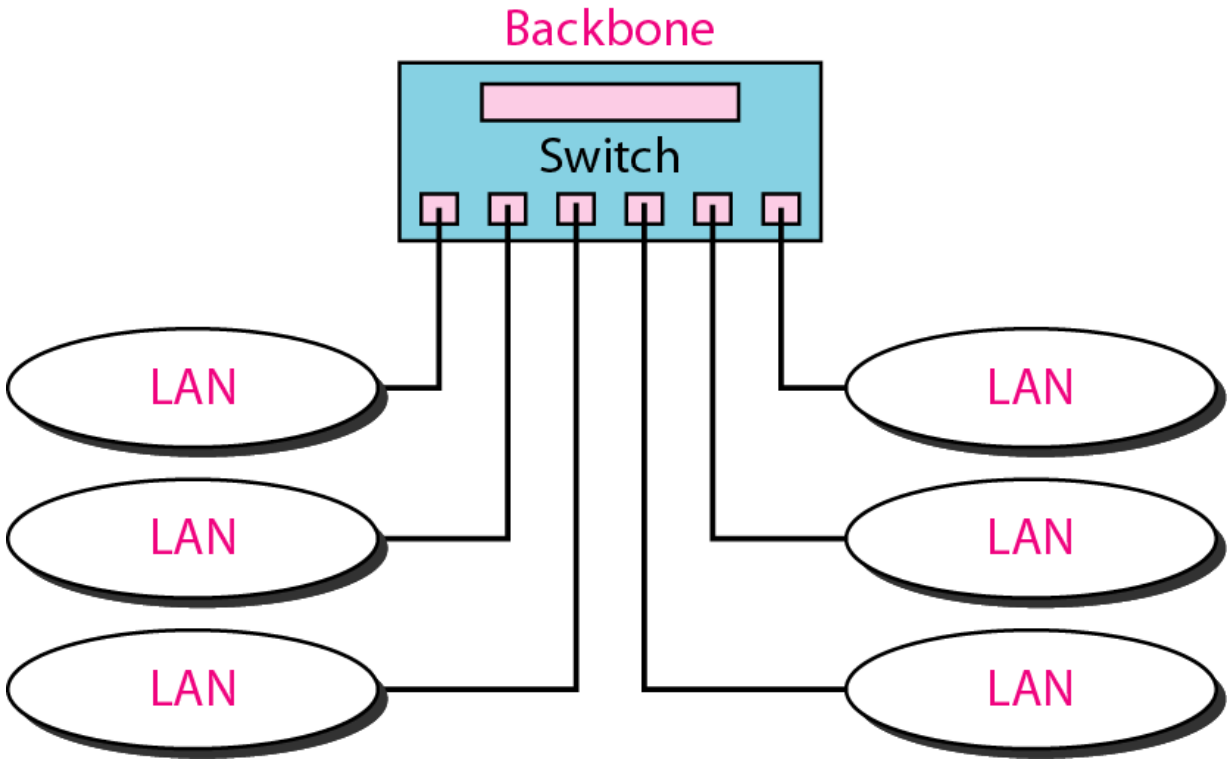
Bus backbone

In a bus backbone, the topology of the backbone is a bus.

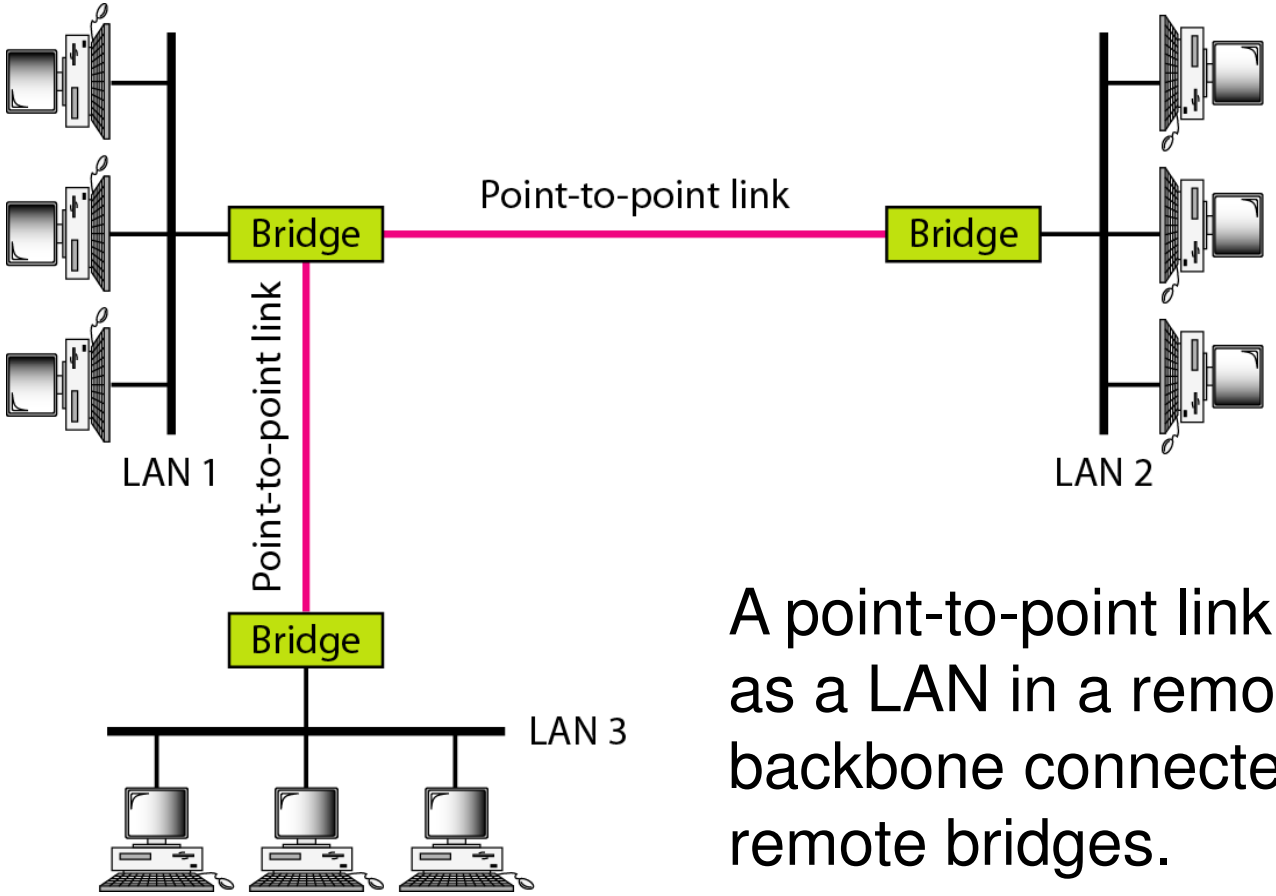


Star backbone

In a star backbone, the topology of the backbone is a star; the backbone is just one switch.



Point-to-point link



A point-to-point link acts as a LAN in a remote backbone connected by remote bridges.