Unit - 3

Connecting LANs, Backbone Networks, and Virtual LANs

15-1 CONNECTING DEVICES

In this section, we divide connecting devices into five different categories based on the layer in which they operate in a network.

Topics discussed in this section:

Passive Hubs

Active Hubs

Bridges

Two-Layer Switches

Routers

Three-Layer Switches

Gateways

Figure 15.1 Five categories of connecting devices

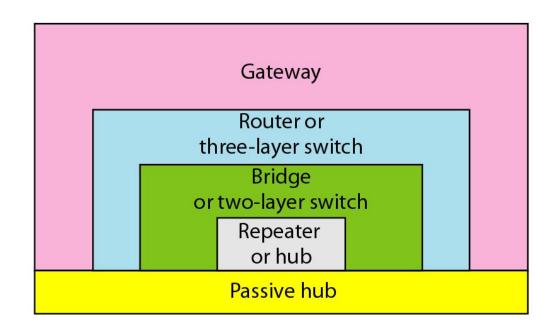
Application

Transport

Network

Data link

Physical



Application

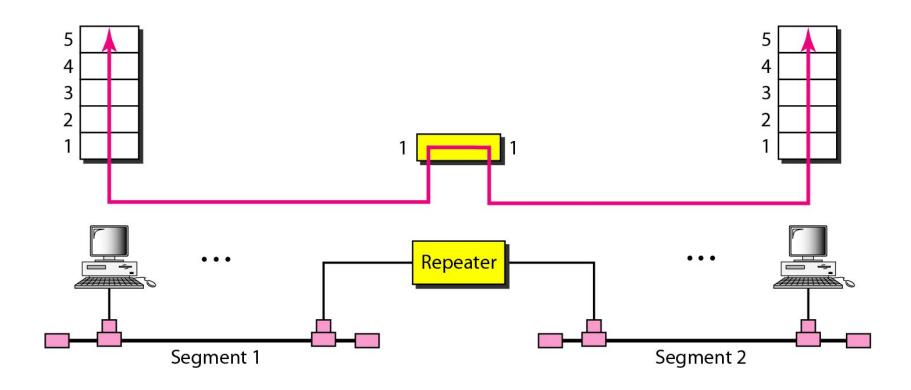
Transport

Network

Data link

Physical

Figure 15.2 A repeater connecting two segments of a LAN





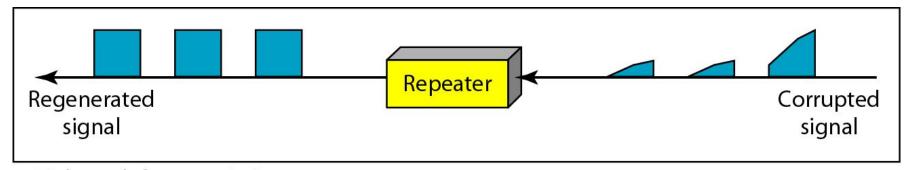
A repeater connects segments of a LAN.

A repeater forwards every frame; it has no filtering capability.

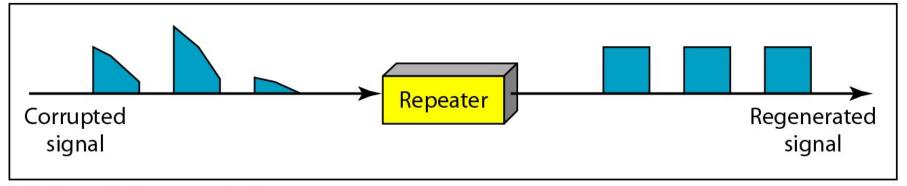
A repeater is a regenerator, not an amplifier.

- bit for bit copy
- 2. remove noise, but do not correct/detect error
- 3. Recover the signal strength

Figure 15.3 Function of a repeater



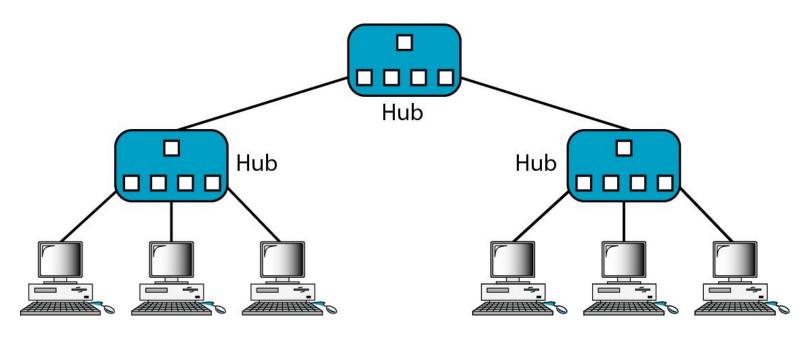
a. Right-to-left transmission.



b. Left-to-right transmission.

Figure 15.4 A hierarchy of hubs

A hub is actually a multiport repeater

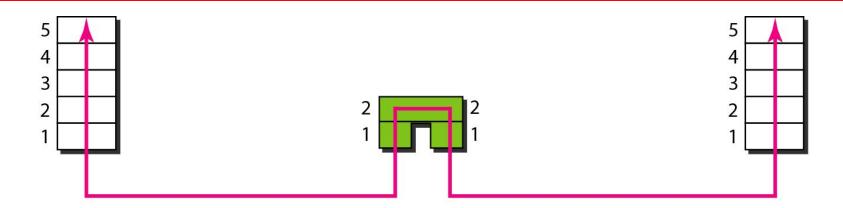




A bridge checks MAC addresses. It has a table used in filtering decisions (Forward? Drop?). The table shows the map between MAC addresses and ports.

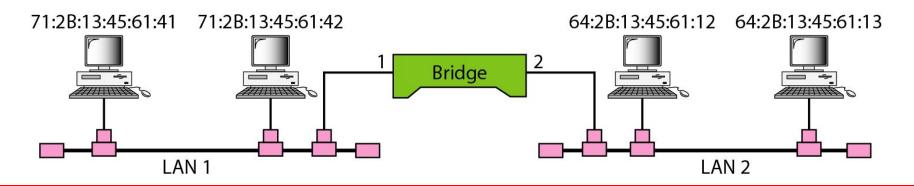
In Ethernet, Ethernet switch is a bridge device

Figure 15.5 A bridge connecting two LANs



| 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





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

Figure 15.6 A learning bridge and the process of learning

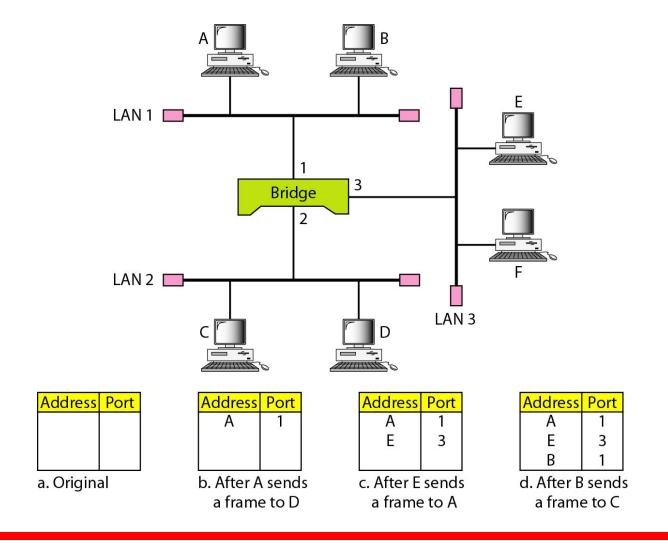
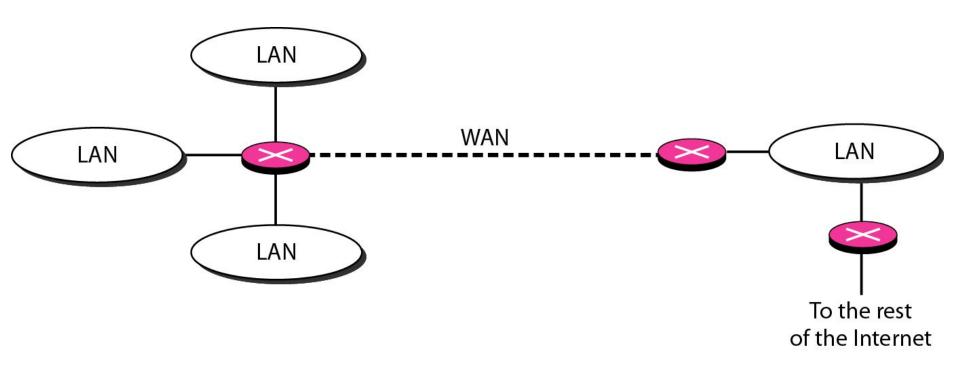


Figure 15.11 Routers (layer-three switch) connecting independent LANs and WANs



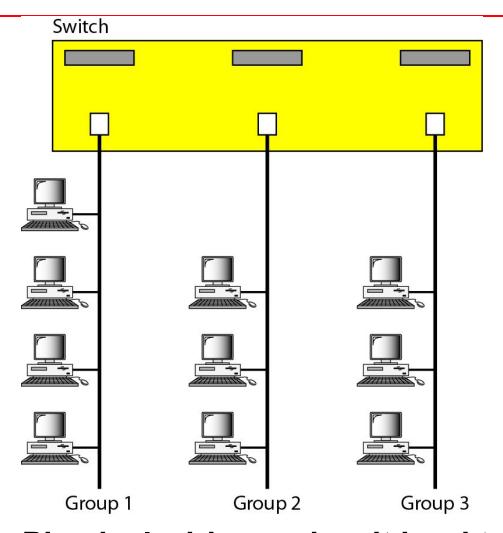
15-3 VIRTUAL LANS

We can roughly define a virtual local area network (VLAN) as a local area network configured by software, not by physical wiring.

Topics discussed in this section:

Membership
Configuration
Communication between Switches
IEEE Standard
Advantages

Figure 15.15 A switch connecting three LANs



Physical wiring makes it hard to dynamically change group allocation

Figure 15.16 A switch using VLAN software

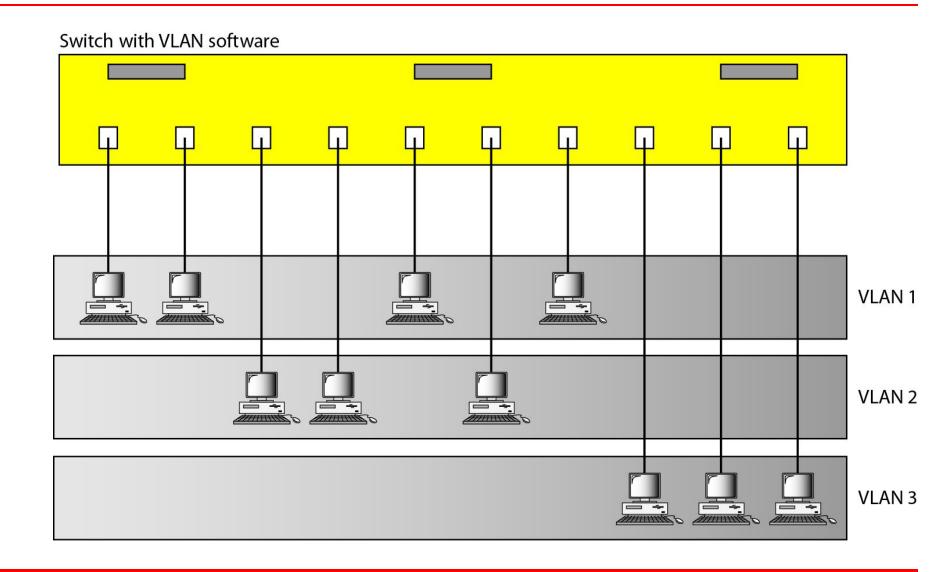
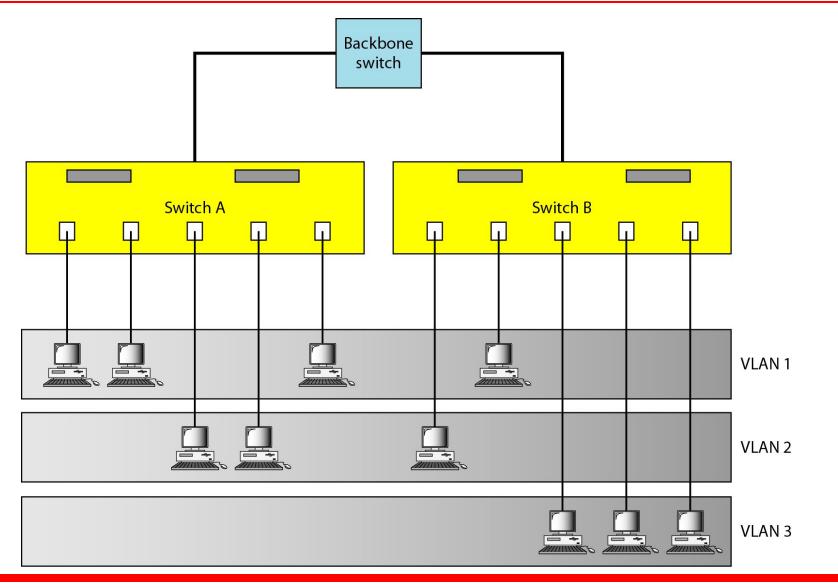


Figure 15.17 Two switches in a backbone using VLAN software



Good for a company with two separate buildings

Note

VLANs create broadcast domains.

VLAN: Membership Definition

- Switch port Numbers
- MAC Address
- IP Address
- Multicast IP Address
- Combination

VLAN Configuration

- Manually
- Automatic
- Semiautomatic

VLAN: Communication between switches

- Table maintenance
- Frame tagging
 - Extra header added to MAC frame to define the destination VLAN
- Time-Division Multiplexing (TDM)

VLAN: Advantages

- Cost and time reduction
- Creating Virtual Work Groups
- Security
 - Separation of broadcast messages