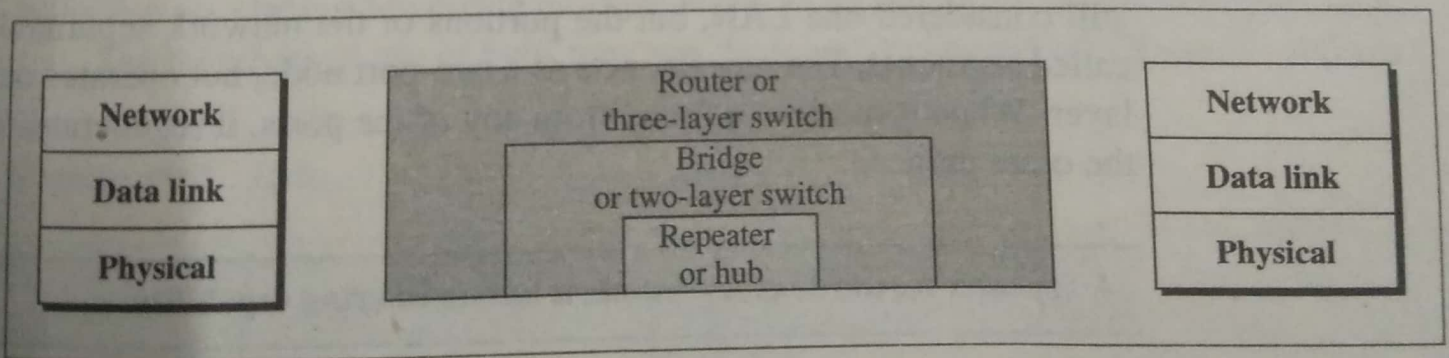


## 16.1 CONNECTING DEVICES

There are five kinds of connecting devices: repeaters, hubs, bridges, and two- and three-layer switches. Repeaters and hubs operate in the first layer of the Internet model. Bridges and two-layer switches operate in the first two layers. Routers and three-layer switches operate in the first three layers. Figure 16.1 shows the layers in which each device operates.

✓ Figure 16.1 Connecting devices

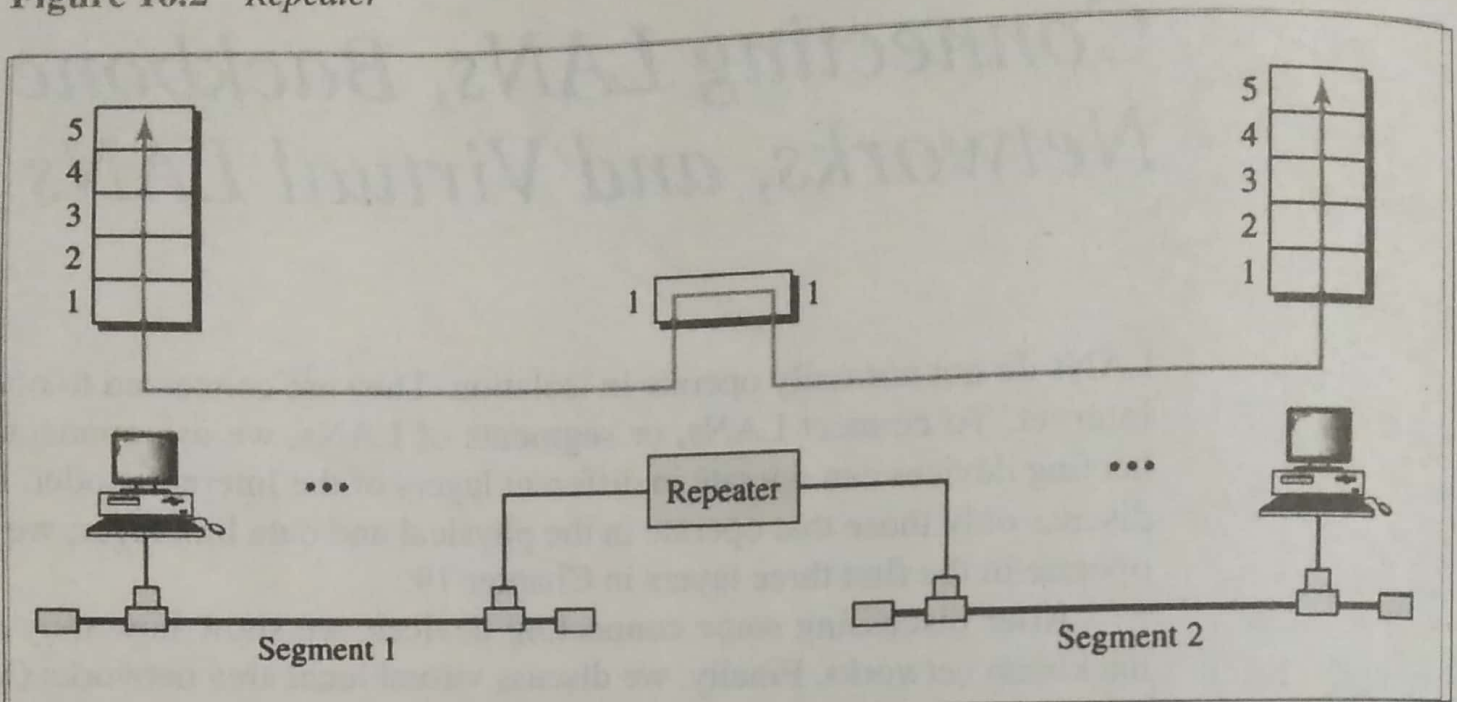


### Repeaters

A repeater is a device that operates only in the physical layer. Signals that carry information within a network can travel a fixed distance before attenuation endangers the integrity of the data. 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. A repeater can extend the physical length of a LAN, as shown in Figure 16.2.

Figure 16.2 Repeater



A repeater does not actually connect two LANs; it connects two segments of the same LAN. The segments connected are still part of one single LAN. A repeater is not a device that can connect two LANs of different protocols.

**A repeater connects segments of a LAN.**

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

It is tempting to compare a repeater to an amplifier, but the comparison is inaccurate. An **amplifier** cannot discriminate between the intended signal and noise; it amplifies equally everything fed into it. A repeater does not amplify the signal; it regenerates the signal. When it receives a weakened or corrupted signal, it creates a copy, bit for bit, at the original strength.

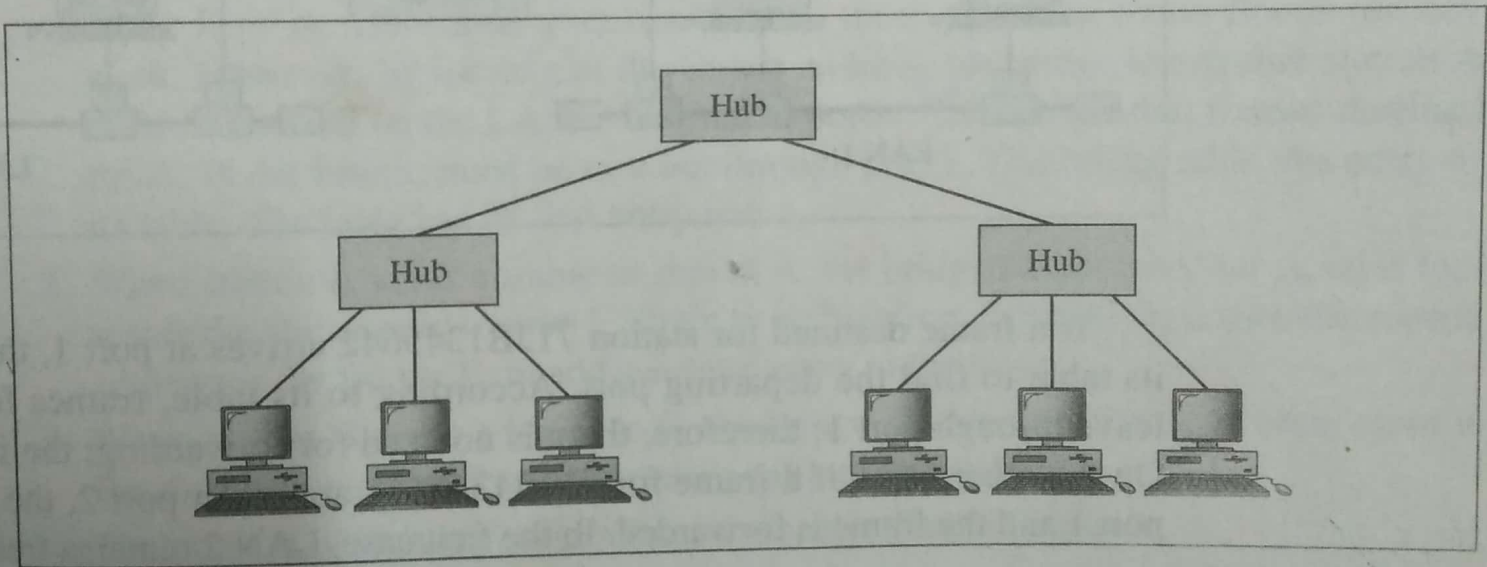
A repeater is a regenerator, not an amplifier.

## Hubs

Although, in a general sense, the word *hub* can refer to any connecting device, it does have a specific meaning. A **hub** is actually a multiport repeater. It is normally used to create connections between stations in a physical star topology. We have seen examples of hubs in some Ethernet implementations (10Base-T, for example). However, hubs can also be used to create multiple levels of hierarchy, as shown in Figure 16.4.

The hierarchical use of hubs removes the length limitation of 10Base-T (100 m).

Figure 16.4 Hubs



## Bridges

A bridge operates in both the physical and the data link layers. 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 (source and destination) contained in the frame.

### Filtering

One may ask, What is the difference in functionality between a bridge and a repeater? A bridge has **filtering** capability. It can check the destination address of a frame and decide if the frame should be forwarded or dropped. If the frame is to be forwarded, the decision must specify the port. A bridge has a table that maps addresses to ports.

A bridge has a table used in filtering decisions.

Let us give an example. In Figure 16.5, two LANs are connected by a bridge.

Figure 16.5 Bridge

