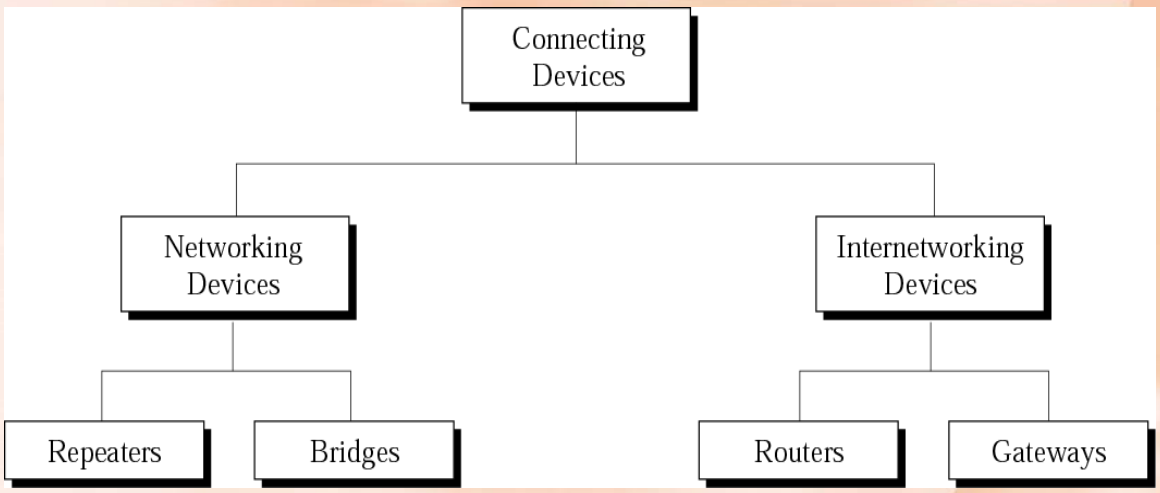
Computer Networks and Communications

Lecture (08):

Connectivity Devices

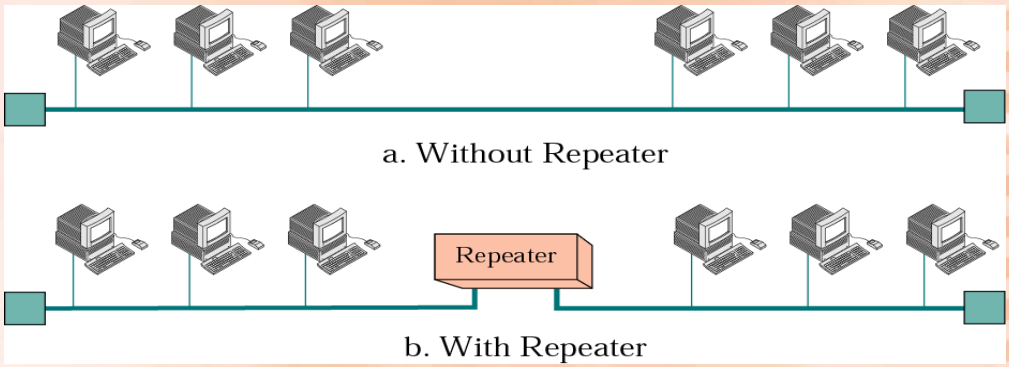
Connectivity Devices

Connecting devices can be divided into four types based on their functionality as related to the layers in the OSI model: repeaters, bridges, routers, and gateways. Repeaters and bridges typically connect devices in a network. Routers and gateways typically connect networks into internetworks.



REPEATERS

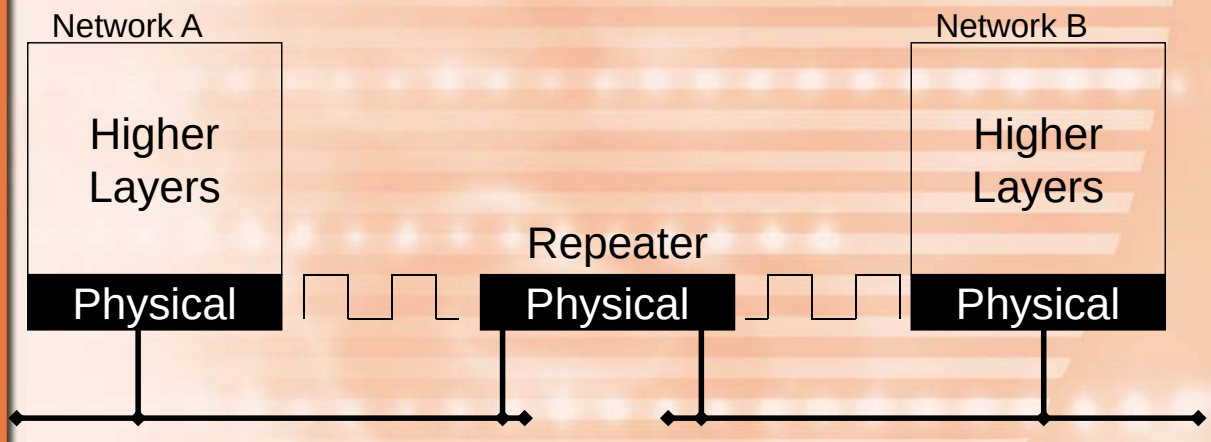
A repeater is an electronic device that regenerates data. It extends the physical length of a network. As a signal is transmitted, it may lose strength, and a weak signal may be interpreted erroneously by a receiver. A repeater can regenerate the signal and send it to the rest of the network.



Repeaters operate at the first layer of the OSI model.

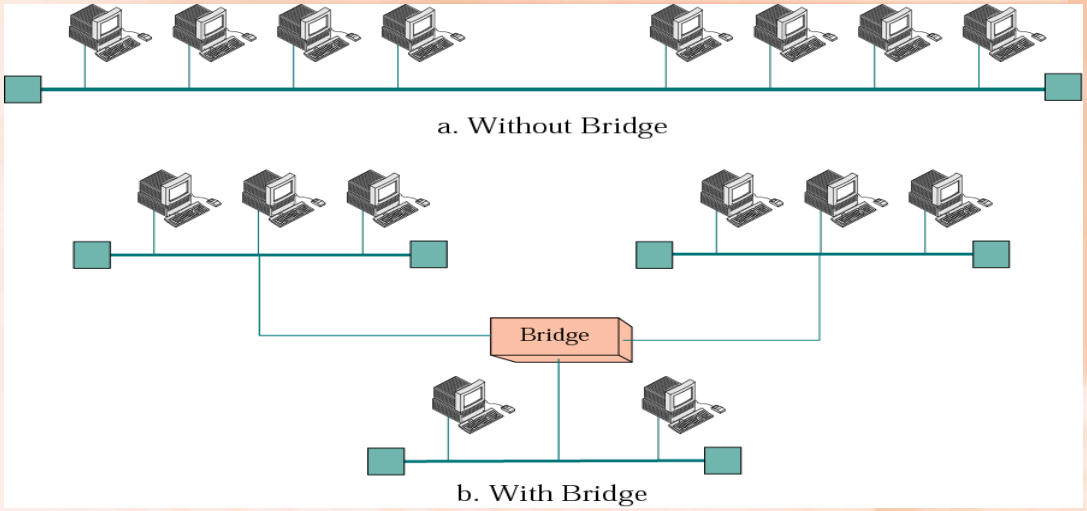
REPEATERS

- Regenerates and propagates all electrical transmissions between 2 or more LAN segments
- Allows extension of a network beyond physical length limitations
- Layer 1 of the “OSI model”



BRIDGES

A bridge is a traffic controller. It can divide a long bus into smaller segments so that each segment is independent trafficwise. The bridge uses a table to decide if the frame needs to be forwarded to another segment. With a bridge, two or more pairs of stations can communicate at the same time.



BRIDGES

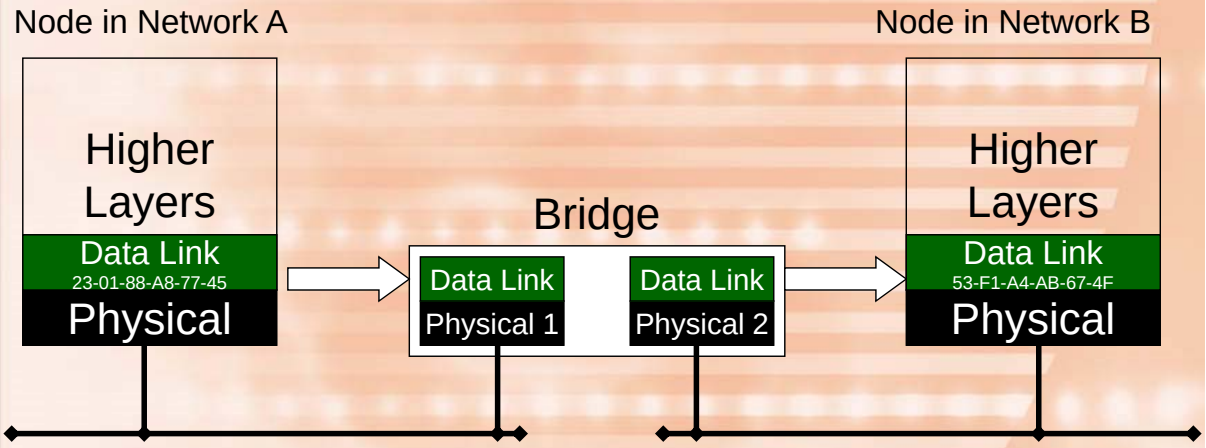
In addition to its traffic controlling duties, a bridge also functions as a repeater by regenerating the frame. This means that a bridge operates at the physical layer. But because a bridge needs to interpret the address embedded in the frame to make filtering decisions, it also operates at the data-link layer of the OSI model.

Bridges operate at the first two layers of the OSI model.

In recent years, the need for better performance has led to the design of a new device referred to as a second-layer switch, which is simply a sophisticated bridge with multiple interfaces. The media are not shared; each station is directly connected to the switch.

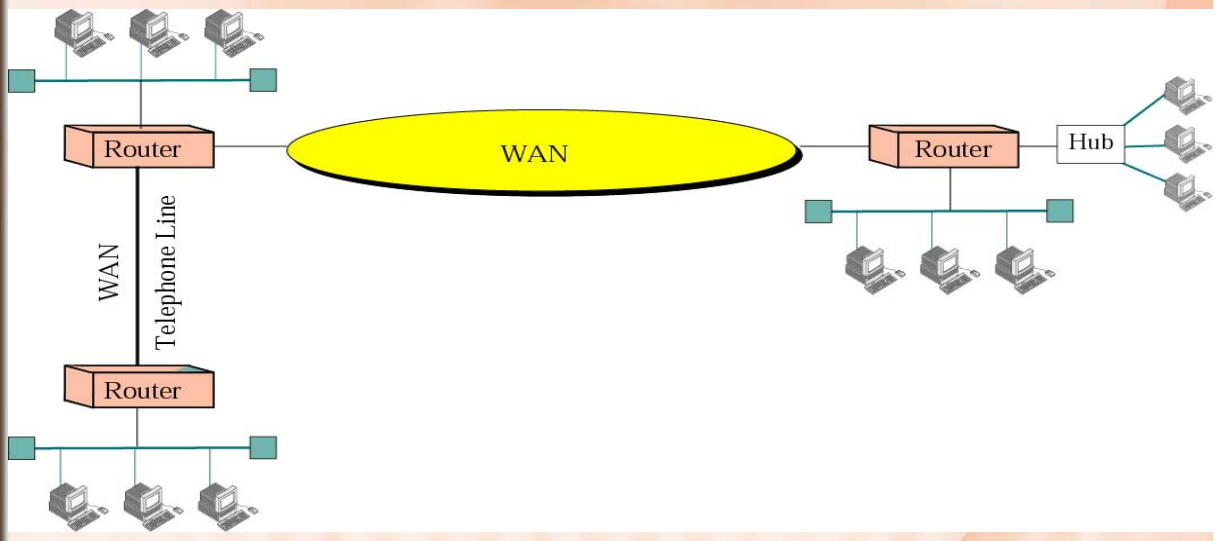
BRIDGES

- Connects 2 or more LAN segments and uses data link layer addresses (e.g.MAC addresses) to make data forwarding decisions
- Copies frames from one network to the other
- Layer 2 of the “OSI model”



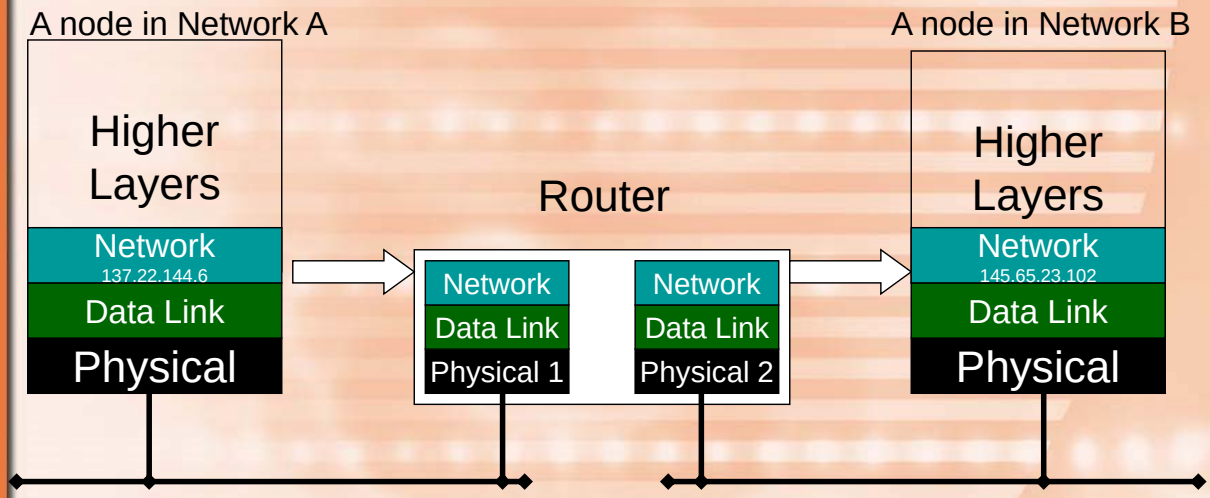
ROUTERS

Routers are devices that connect LANs, MANs, and WANs. A router operates at the third layer of the OSI model. Whereas a bridge filters a frame based on the physical (data-link layer) address of the frame, a router routes a packet based on the logical (network layer) address of the packet.



ROUTERS

- Connects 2 or more networks and uses network layer addresses (like IP address) to make data forwarding decisions
- Layer 3 of the “OSI model”



GATEWAYS

Traditionally, a gateway is a connecting device that acts as a protocol converter. It allows two networks, each with a different set of protocols for all seven OSI layers, to be connected to each other and communicate.

A gateway is usually a computer installed with the necessary software. The gateway understands the protocols used by each connected network and is therefore able to translate from one to another. For example, a gateway can connect a network using the Apple Talk protocol to a network using the Novell Netware protocol.

GATEWAYS

- Connects 2 or more networks that can be of different types and provides protocol conversion so that end devices with dissimilar protocol architectures can interoperate