

## **Connecting (Communication Devices)**

We use **connecting devices** to connect hosts together to make a network or to connect networks together to make an internet. Connecting devices can operate in different layers of the Internet model. There are three main types of *connecting devices*: hubs, link-layer switches, and routers.

**Hubs today operate in the physical layer (first layer) of the TCP/IP protocol suite.** A hub just repeats whatever it hears on one port out all its other ports. A hub is also called a multiport (multiway) repeater. A hub forwards the signal to all outgoing ports except the one from which the signal was received.

**Link-layer switches operate in the first two layers (i.e., physical layer and data-link layer).** As a physical-layer device, it regenerates the signal it receives. As a link-layer device, the link-layer switch can check the MAC addresses (source and destination) contained in the frame. In general, we refer to a switch as a link-layer device. A link-layer switch has **filtering** capability. It can check the destination address of a frame and can decide from which outgoing port the frame should be sent (difference with a hub).

**Routers operate in the first three layers (i.e., physical, data link and network layers).** As a physical-layer device, it regenerates the signal it receives. As a link-layer device, the router checks the physical addresses (source and destination) contained in the packet. As a network-layer device, a router checks the network-layer addresses.

**A router can connect networks.** In other words, a router is an internetworking device; it connects independent networks to form

an internetwork. According to this definition, two networks connected by a router become an internetwork or an internet. **There are three major differences between a router and a repeater or a switch.**

1. A router has a physical address (link-layer address/MAC address) as well as a logical (IP) address for each of its interfaces.
2. A router acts only on those packets in which the link-layer destination address matches the address of the interface at which the packet arrives.
3. A router changes the link-layer address of the packet (both source and destination) when it forwards the packet.

## Reference

[1] 1. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, 6th Ed, 2022, McGraw Hill. **(Refer to Chapter 6, sections 6.1.1, 6.1.2, and 6.1.3 for more details and figures)**

[2] Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, 5th Ed, 2012 (Chapter 3).