

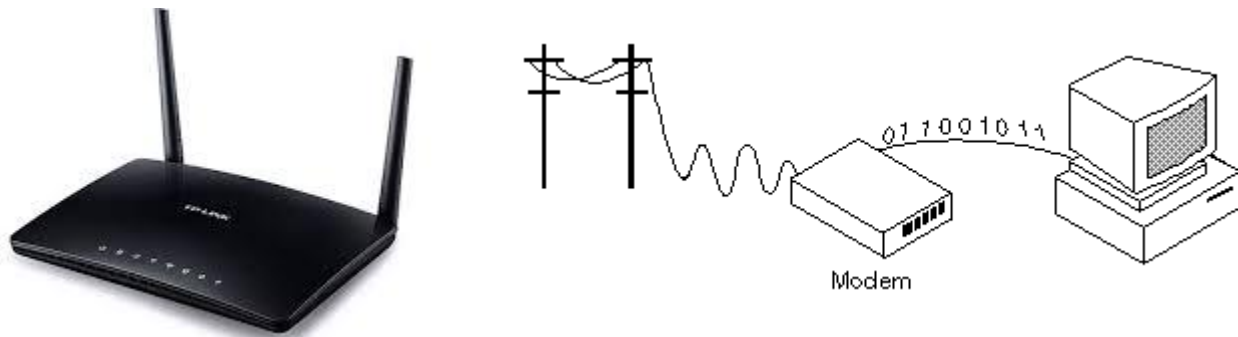
Chapter -1 Computer networking

Network Devices./ Connectivity devices

Hardware **devices** that are used to connect computers, printers, fax machines and other electronic **devices** to a **network** are called **network devices**. These **devices** transfer data in a fast, secure and correct way over same or different **networks**. **Network devices** may be inter-**network** or intra-**network**.

The basic computer hardware components that are needed to set up a network are as follows:

Modem. **Modem** is short for "Modulator-Demodulator." It is a hardware component that allows a computer or another device, such as a router or switch, to connect to the Internet. ... Similarly, it converts digital data from a computer or other device into an analog signal that can be sent over standard telephone lines.



Network Cables

Network cables are the transmission media to transfer data from one device to another. A commonly used network cable is category 5 cable with RJ – 45 connector, as shown in the image below:

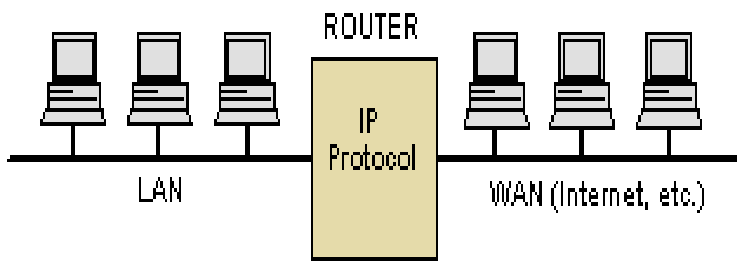


Routers

A router is a connecting device that transfers data packets between different computer networks. Typically, they are used to connect a PC or an organization's LAN to a broadband internet connection. They contain RJ-45 ports so that computers and other devices can connect with them using network cables.

Routers are also used to divide internal networks into two or more subnetworks. Routers can also be connected internally to other routers, creating zones that operate independently. Routers establish communication by maintaining tables about destinations and local connections. A router contains information about the systems connected to it and where to send requests if the destination isn't known. Routers usually communicate routing and other information using one of three standard protocols: Routing Information Protocol (RIP), Border Gateway Protocol (BGP) or Open Shortest Path First (OSPF).

Routers are your first line of defense, and they must be configured to pass only traffic that is authorized by network administrators. The routes themselves can be configured as static or dynamic. If they are static, they can only be configured manually and stay that way until changed. If they are dynamic, they learn of other routers around them and use information about those routers to build their routing tables.

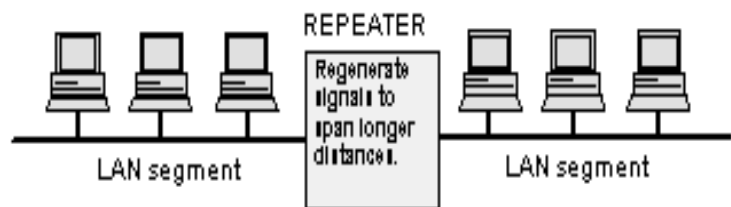


Repeaters, Hubs, and Switches

A repeater is an electronic device that amplifies the signal it receives. You can think of repeater as a device which receives a signal and retransmits it at a higher level or higher power so that the signal can cover longer distances, more than 100 meters for standard LAN cables. Repeaters work on the Physical layer. A repeater receives a signal and regenerates it before re-transmitting so that it can travel longer distances.



REPEATER



Hubs connect multiple computer networking devices together. A hub also acts as a repeater in that it amplifies signals that deteriorate after traveling long distances over connecting cables. A hub is the simplest in the family of network connecting devices because it connects LAN components with identical protocols.

A hub can be used with both digital and analog data, provided its settings have been configured to prepare for the formatting of the incoming data. For example, if the incoming data is in digital format, the hub must pass it on as packets; however, if the incoming data is analog, then the hub passes it on in signal form.

Passive, Active, and Intelligent Hubs

Three basic types of hubs exist:

1. **Passive hubs** don't amplify the electrical signal of incoming packets before broadcasting them out to the network.
2. **Active hubs** perform amplification, much like a **repeater**.

3. **Intelligent hubs** add extra features to an active hub that are of particular importance to businesses. An intelligent hub is typically stackable, meaning that it's built in such a way that multiple units can be placed one on top of the other to conserve space. Intelligent Ethernet hubs often include remote management capabilities via **SNMP** and **virtual LAN (VLAN)** support.

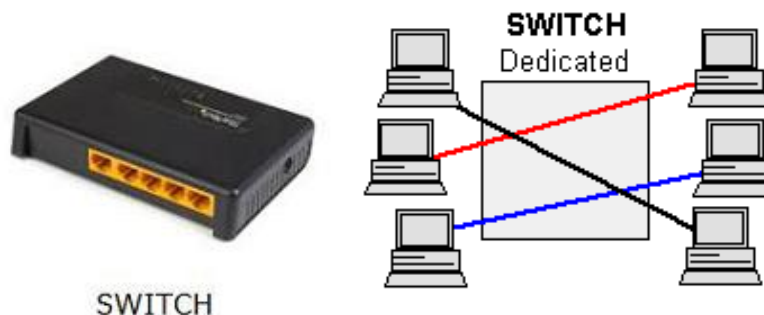


Switches generally have a more intelligent role than hubs. A switch is a multiport device that improves network efficiency. The switch maintains limited routing information about nodes in the internal network, and it allows connections to systems like hubs or routers.

Switches can read the hardware addresses of incoming packets to transmit them to the appropriate destination.

Switches also improve network security because the virtual circuits are more difficult to examine with network monitors. You can think of a switch as a device that has some of the best capabilities of routers and hubs combined. A switch can work at either the Data Link layer or the Network layer of the OSI model. A multilayer switch is one that can operate at both layers, which means that it can operate as both a switch and a router. A multilayer switch is a high-performance device that supports the same routing protocols as routers.

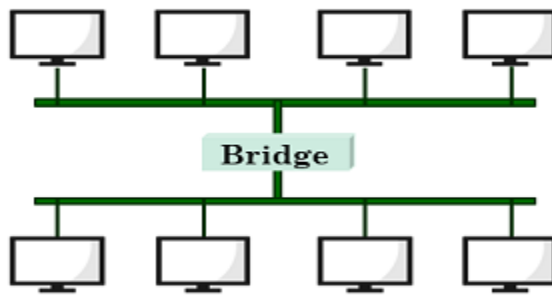
A switch receives data from a port, uses packet switching to resolve the destination device and then forwards the data to the particular destination, rather than broadcasting it as a hub.



Bridges

Bridges are used to connect two or more hosts or network segments together. The basic role of bridges in network architecture is storing and forwarding frames between the different segments that the bridge connects. They use hardware Media Access Control (MAC) addresses for transferring frames.

Bridges work only at the Physical and Data Link layers of the OSI model. Bridges are used to divide larger networks into smaller sections by sitting between two physical network segments and managing the flow of data between the two.

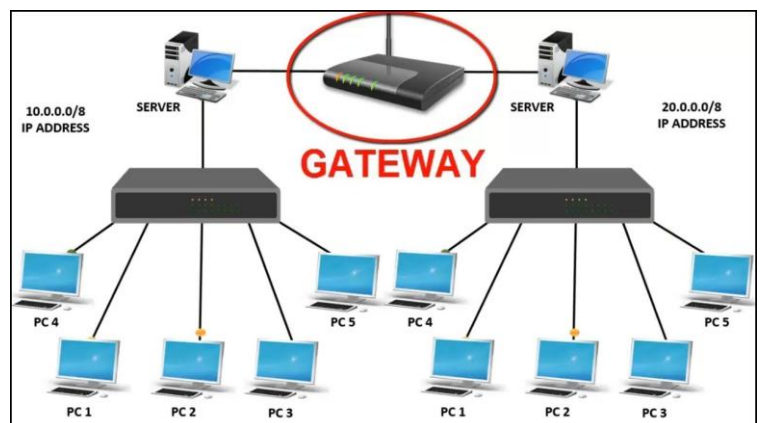


Gateways

A gateway connects entirely different networks that work upon different protocols. It is the entry and the exit point of a network and controls access to other networks.

Gateways normally work at the Transport and Session layers of the OSI model. At the Transport layer and above, there are numerous protocols and standards from different vendors; gateways are used to deal with them. Gateways provide translation between networking technologies such as Open System Interconnection (OSI) and Transmission Control Protocol/Internet Protocol (TCP/IP). Because of this, gateways connect two or more autonomous networks, each with its own routing algorithms, protocols, topology, domain name service, and network administration procedures and policies.

Gateways perform all of the functions of routers and more. In fact, a router with added translation functionality is a gateway. The function that does the translation between different network technologies is called a protocol converter.



Network Interface Cards

NIC is a component of the computer to connect it to a network. Network cards are of two types: Internal network cards and external network cards.



Router. A **router** is a device that functions as both a bridge and a router. It can forward data between networks (serving as a bridge), but can also route data to individual systems within a network (serving as a router). ... Instead, most **routers** are simply routers that have been configured to also function as a bridge

