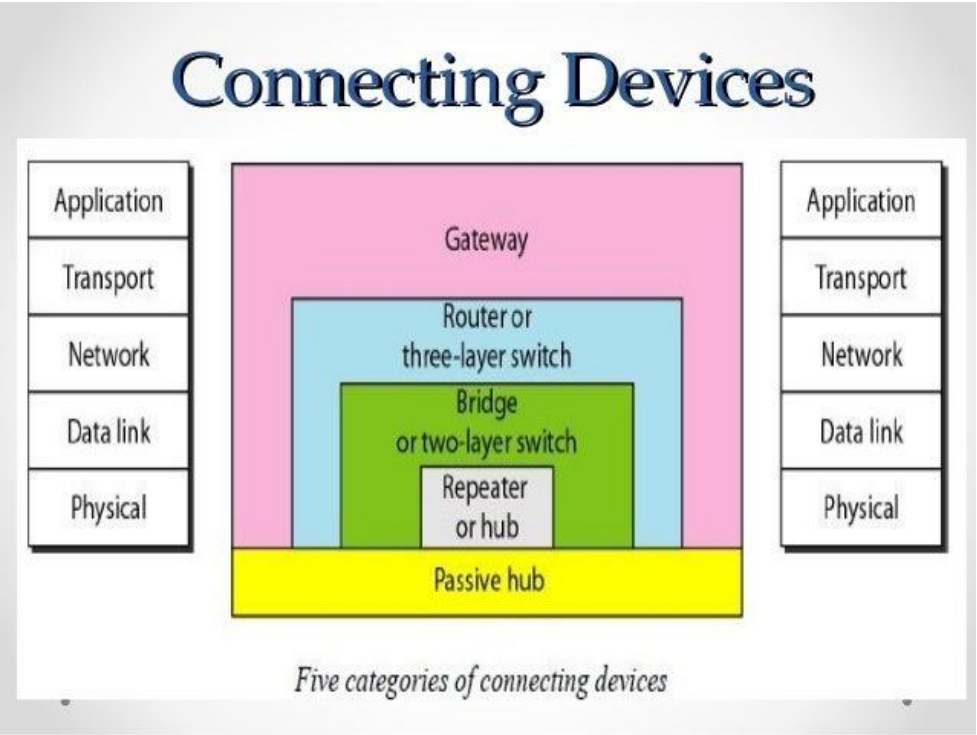
PRACTICAL-4

AIM:Study and Test various Network devices available at Department/Institute. (Repeater, Hub, Switch, Bridge, Router and Gateway).

Network devices are physical devices that allow hardware on a computer network to communicate and interact with each other. Network devices like hubs, repeaters, bridges, switches, routers, gateways, and brouters help manage and direct data flow in a network. They ensure efficient communication between connected devices by controlling data transfer, boosting signals, and linking different networks. Each device serves a specific role, from simple data forwarding to complex routing between networks.



Functions of Network Devices

- Network devices help to send and receive data between different devices.
- Network devices allow devices to connect to the network efficiently and securely.
- Network devices Improve network speed and manage data flow better.
- It protect the network by controlling access and preventing threats.
- Expand the network range and solve signal problems.

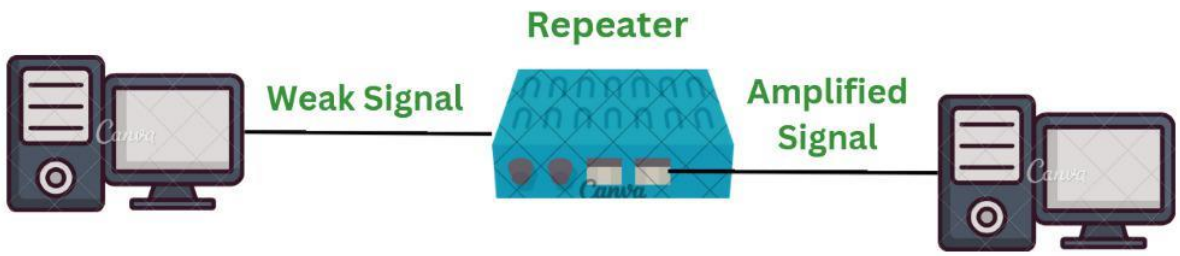
Types of Networking Devices and Their Uses

Network devices work as a mediator between two devices for transmission of data, and thus play a very important role in the functioning of a computer network. Below are some common network devices used in modern networks:

- Repeater
- Hub
- Bridge
- Switch
- Routers
- Gateway

REPEATER:

A repeater is a networking device that helps to amplify and regenerate signals to increase the reach of a network. Also operating at the physical layer of the OSI model, repeaters help overcome distance-related limitations by strengthening the strength and quality of the signal. They are instrumental in LANs and WANs as they minimize errors, reduce data loss, and ensure reliable delivery to specific locations. One of the primary benefits of repeaters is the error free transfer of data over longer distances. This will ensure efficient and safe communication.



Features of Repeaters

- Repeater can regenerate the signal without modifying it.
- Repeaters can be used in analog signals and digital signals.
- Repeaters can extend the range of networks.
- Dynamic networking is supported by repeater.
- Use of Repeaters reduces error and loss of data.
- Power is required for working of repeaters.

- Using repeater can add complexity in the network.

Types of Repeaters

1. According to the type of Signals

- Analog Repeater: Analog repeaters are used to amplify only the analog signals. Analog repeaters receives the analog signal, amplifies it and then regenerates it as the output. Analog repeaters were mostly used in the older network technologies where analog signal was used.
- Digital Repeater: Digital repeaters are the type of repeaters that does not amplify digital signal but regenerates it directly. Digital repeaters are mostly used in the modern technologies where digital signal is being used. Digital repeaters are also capable to reconstruct a distorted signal.

2. According to the type of Connected Network

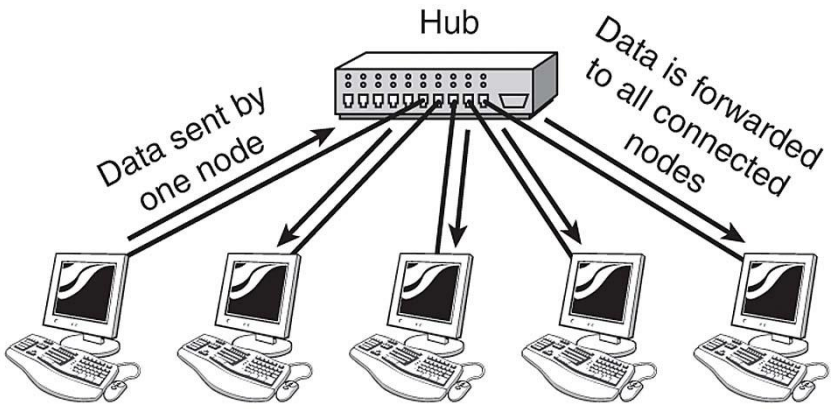
Based on the type of network the repeaters can connect they are categorized as below:

- Wired Repeaters: Wired repeaters are used in wired Local Area Networks(LANs). Wired repeater receives the signal and repeats it. This helps to extend the network travel data without loosing it's strength and data.
- Wireless Repeaters: Wireless repeaters are used in wireless Local Area Networks(LANs) and Cellular networks. A router connected in the network sends wireless signal to the repeater. Once received, repeater broadcast the signal to increase the coverage of network.

HUB:

Hub in networking plays a vital role in data transmission and broadcasting. A hub is a hardware device used at the physical layer to connect multiple devices in the network. Hubs are widely used to connect LANs. A hub has multiple ports. Unlike a switch, a hub cannot filter the data, i.e. it cannot identify the destination of the packet, So it broadcasts or sends the message to each port.

A hub is a multi-port repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations. Hubs cannot filter data, so data packets are sent to all connected devices. In other words, the collision domain of all hosts connected through hub remains one. Hub does not have any routing table to store the data of ports and map destination addresses., the routing table is used to send/broadcast information across all the ports.



Types of Network Hubs

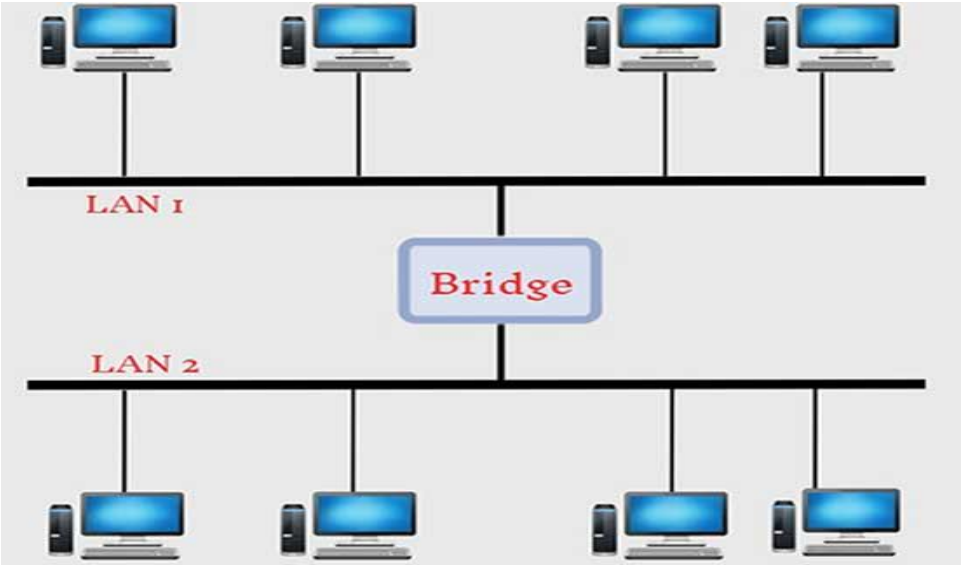
Networks hubs are classified into three types:

1. Active Hub: They have a power supply for regenerating, and amplifying the signals. When a port sends weak signalled data, the hub regenerates the signal and strengthens it, then send it further to all other ports. Active hubs are expensive in costs as compared to passive hubs.
2. Passive Hub: Passive hubs are simply used to connect signals from different network cables as they do not have any computerised element. They simply connect the wires of different devices in the star topology. Passive hubs do not do any processing or signal regeneration and that's why do not require electricity the most they can do is they can copy or repeat the signal. It can't clean the message, and it can't amplify or strengthen the signal.
3. Intelligent Hub: Intelligent hubs as the name suggests are smarter than active and passive hubs. The intelligent hub comprises a special monitoring unit named a Management Information Base (MIB). This is software that helps in analysing and troubleshooting network problems. Intelligent hubs work similarly to active hubs but with some management features. Like it can monitor the traffic of the network and the configuration of a port.

BRIDGE:

A bridge in a computer network is a device used to connect multiple LANs together with a larger Local Area Network (LAN). The mechanism of network aggregation is known as bridging. The bridge is a physical or hardware device but operates at the OSI model's data link layer and is also known as a layer of two switches.

The primary responsibility of a switch is to examine the incoming traffic and determine whether to filter or forward it. Basically, a bridge in computer networks is used to divide network connections into sections, now each section has a separate bandwidth and a separate collision domain. Here bridge is used to improve network performance.



Types of Bridges

- Transparent Bridge: Transparent bridges are invisible to other devices on the network. This bridge doesn't reconfigure the network on the addition or deletion of any station. The prime function of the transparent bridge is to block or forward the data according to the MAC address.
- Source Routing Bridge: Source routing bridges were developed and designed by IBM specifically for token ring networks. The frame's entire route is embedded with the data frames by the source station to perform the routing operation so that once the frame is forwarded it must follow a specific defined path/route.

SWITCH:

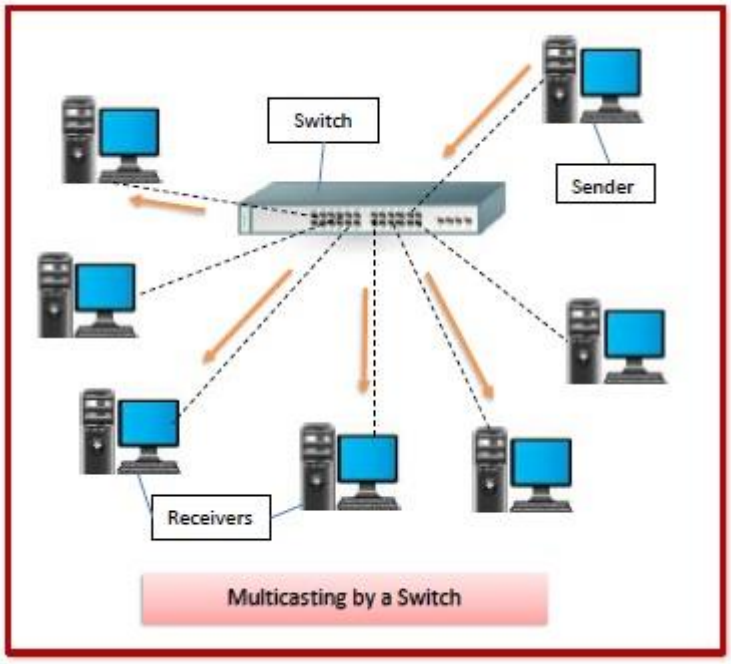
The Switch is a network device that is used to segment the networks into different subnetworks called subnets or LAN segments. It is responsible for filtering and forwarding the packets between LAN segments based on MAC address.

Switches have many ports, and when data arrives at any port, the destination address is examined first and some checks are also done and then it is processed to the devices. Different types of communication are supported here like unicast, multicast, and broadcast communication.

Features of Network Switches

- It operates in the Data Link Layer in the OSI Model.
- It performs error checking before forwarding data.
- It transfers the data only to the device that has been addressed.
- It operates in full duplex mode.
- It allocates each LAN segment to a limited bandwidth.
- It uses Unicast (one-to-one), multicast (one-to-many), and broadcast (one-to-all) transmission modes.

- Packet-switching techniques are used to transfer data packets from source to destination.
- Switches have a more significant number of ports.



ROUTER:

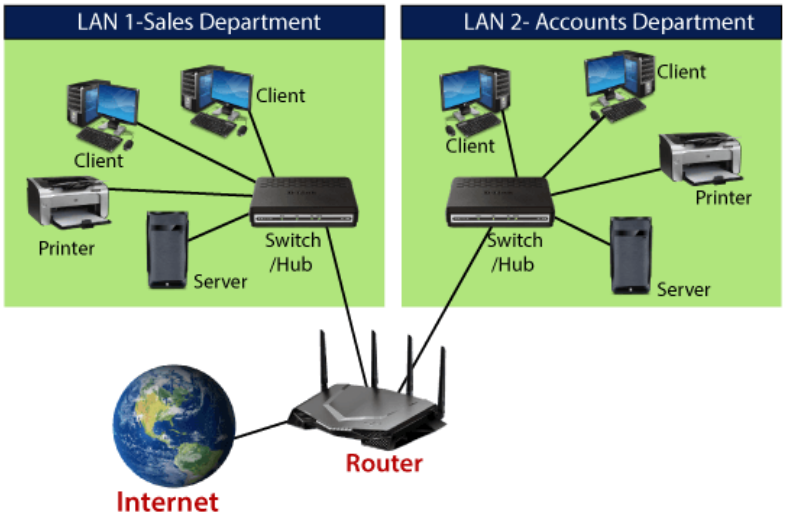
A Router is a networking device that forwards data packets between computer networks. One or more packet-switched networks or subnetworks can be connected using a router. By sending data packets to their intended IP addresses, it manages traffic between different networks and permits several devices to share an Internet connection.

Types of Router

There are several types of routers. Some of them are mentioned below:

1. Broadband Routers: These are one of the important kinds of routers. It is used to do different types of things. it is used to connect computers or it is also used to connect to the internet.
2. Wireless routers: These routers are used to create a wireless signal in your office or home.
3. Wired Routers: Wired Router is used to connects multiple wired devices using a Ethernet cable, It takes the transmission data from the modem and distribute it to a further network, it is widely used in schools and small offices.
4. Edge Routers: As the name indicates, these are located at the edges usually connected to an Internet Service Provider, and distribute packets across multiple packets.

5. Core Routers: Core routers distribute packets within the same network. The main task is to carry heavy data transfers.
6. Virtual Router: They are implemented using a software on the virtual machine , and they are more flexible and scalable.
7. Portable Routers: They are used to create private Wi-Fi and hence designed for easy portability.



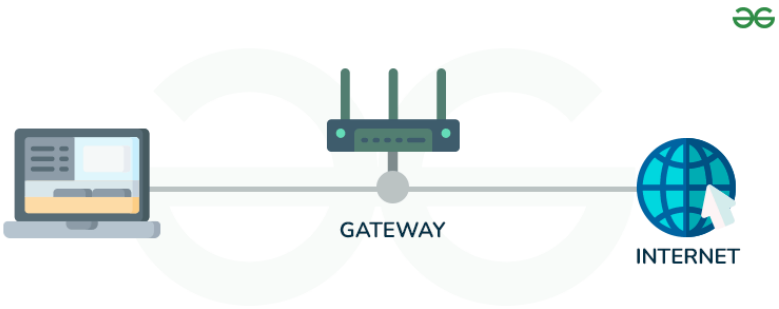
GATEWAY:

A gateway is a connecting point of any network that helps it to connect with different networks. The gateway monitors and controls all the incoming and outgoing traffic of the network. Suppose there are two different networks and they want to communicate with each other, so they need to set up a path between them. Now that path will be made between gateways of those different networks. Gateways are also known as protocol converters because they help to convert protocol supported by traffic of the different networks into that are supported by this network. Because of that, it makes smooth communication between two different networks.

How does Gateway Work?

Gateway has a simple working methodology of five steps:

- Step 1: It gets data from the network
- Step 2: It intercepts and analyzes the received data.
- Step 3: It routes the data to the destination address.
- Step 4: It converts the received data to make that compatible with the receiver network.
- Step 5: It sends the final data inside the network.



Introduction of Gateways

Different Types of Gateways

Gateways can be classified into multiple categories on different bases like on the basis of the direction of flow of data, functionality, etc...

On the Basis of the Direction of the Flow of Data

- Unidirectional Gateways: Unidirectional Gateway allows the flow of data in only one direction. It means the changes that occurred in the source can be copied to the destination but the changes that occurred in the destination can't be copied to the source.
- Bidirectional Gateways: Bidirectional Gateways allow the flow of data in both directions. It means changes that occurred in the source can be copied to the destination and changes that occurred in the destination can be copied to the source.