

Data Communications and Networking

Lab Experiments

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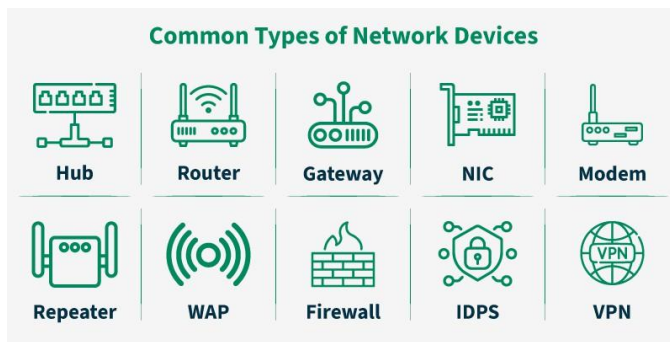
Batch- CSF (B-6)

Experiment:- 01

familiarization with communication devices

Network Devices

They are Physical devices that allow hardware on a computer network to communicate and interact with each other.



Functions of Network Devices

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

8 Common 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.

Access Point

It is a device that allows wireless devices to connect to a wired network. It creates a Wi-Fi network that lets wireless devices communicate with the internet or other devices on the network. Access points are used to extend the range of a network or provide Wi-Fi in areas that do not have it. They are Commonly found in homes, offices, and public places to provide wireless internet access.

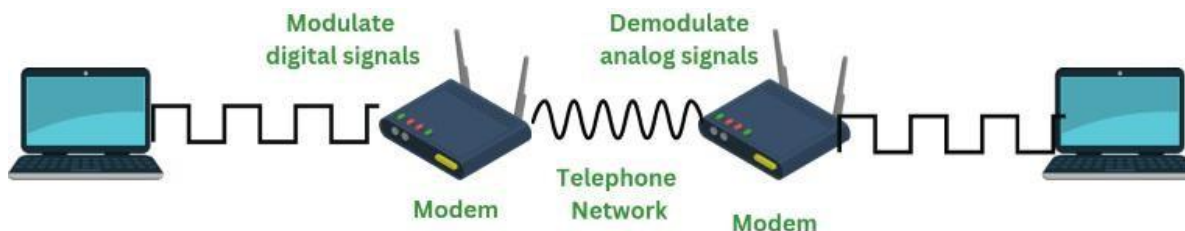


Modems (modulator/demodulator)

It is a network device that is used to convert digital signal into analog signal of different frequencies and transmits these signals to a modem at the receiving location. These converted signals can be transmitted over the cable systems, telephone lines, and other communication mediums. It is also used to convert analog signal back into digital signal. They are generally used to access internet by customers of an Internet Service Provider (ISP).

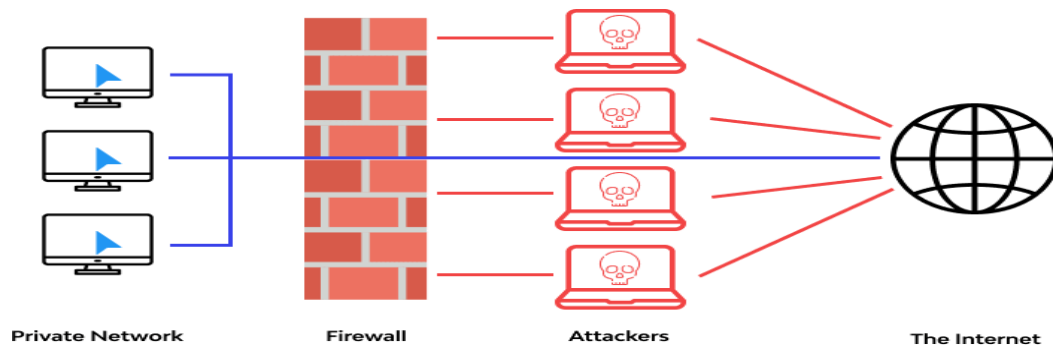
Types of Modems:

1. DSL Modem: Connects via phone lines; slower than other types.
2. Cable Modem: Uses TV cables for faster internet.
3. Wireless Modem: Provides internet via nearby Wi-Fi signals.
4. Cellular Modem: Connects using mobile data from cellular networks.



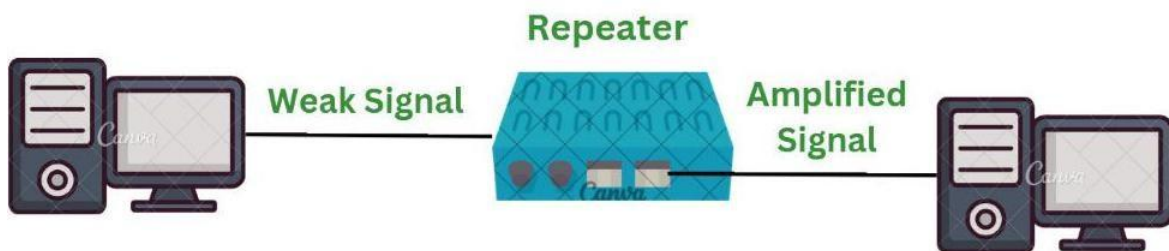
Firewalls

It is a network security device that monitors and controls the flow of data between your computer or network and the internet. It acts as a barrier to blocking unauthorized access while allowing trusted data to pass through. Firewalls help protect your network from hackers, viruses, and other online threats by filtering traffic based on security rules. It can be physical devices, software, or even cloud based services can be offered as SaaS, through public cloud, or private virtual clouds.



Repeater

It is a two-port device which operates at the physical layer. Its main role is to amplify or regenerate the signal over the same network before the signal becomes too weak or corrupted to extend the length to which the signal can be transmitted over the same network. If signal becomes too weak then they copy it bit by bit and regenerate it at its star topology connectors connecting following the original strength.

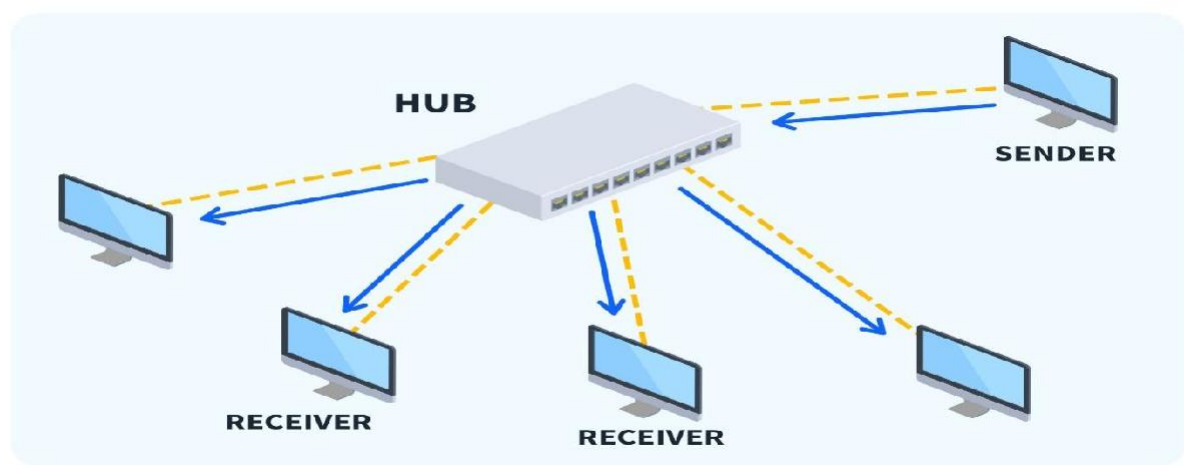


Hub

It is a multiport repeater which connects multiple wires which are coming from different branches like connector in star topology connects different stations. It cannot filter data which means data packets are sent to all connected devices (The collision domain of all hosts connected through Hub remains one). Also, they do not have the intelligence to find out the best path for data packets which leads to inefficiencies and wastage.

Types of Hubs:

1. Active Hub: Powered hubs that clean, boost, and relay signals; act as repeaters and wiring centres, extending network distances.
2. Passive Hub: Collect wiring from nodes without cleaning or boosting signals; cannot extend network distances.
3. Intelligent Hub: Like active hubs but with remote management, flexible data rates, and traffic monitoring capabilities.

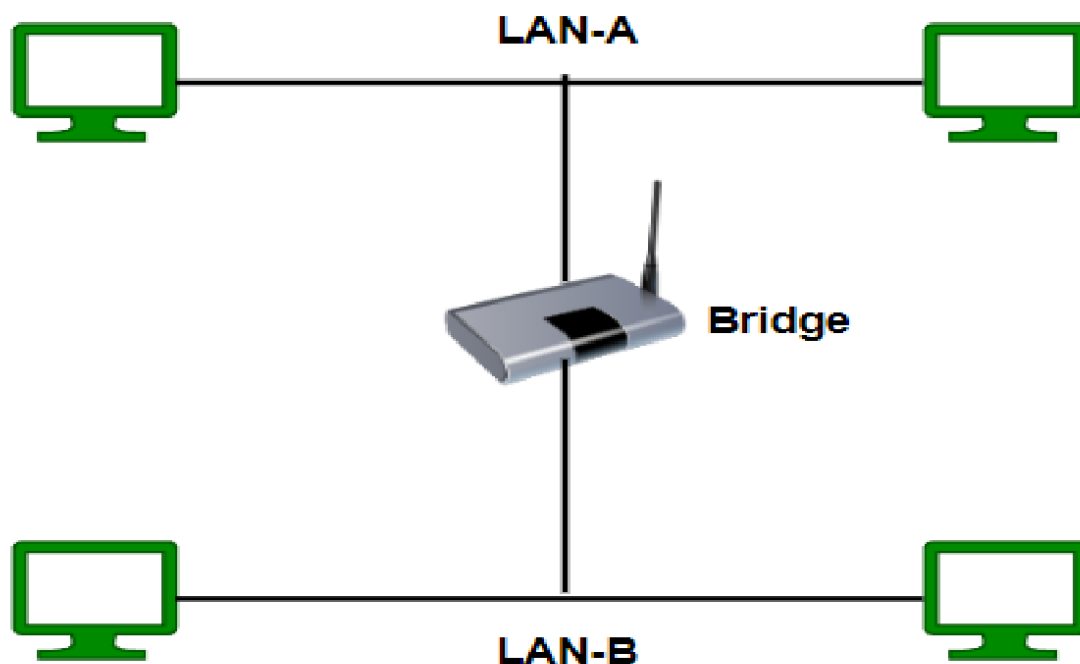


Bridge

It operates at the data link layer which acts like a repeater with add on the functionality of filtering content by reading the MAC addresses of the source and destination. It is also used for interconnecting two LANs working on the same protocol. It typically connects numerous network segments, and each port is connected to different segment. It is not only strictly limited to two ports but can have multiple ports to connect and manage multiple segments. Modern multi-port bridges are often called Layer 2 switches because they perform similar functions.

Types of Bridges:

1. Transparent Bridges: Stations are unaware of the bridge's presence; no reconfiguration needed. Utilize bridge forwarding and bridge learning processes.
2. Source Routing Bridges: Routing is managed by the source station, with frames specifying the route. A discovery frame is used to identify paths across the network.

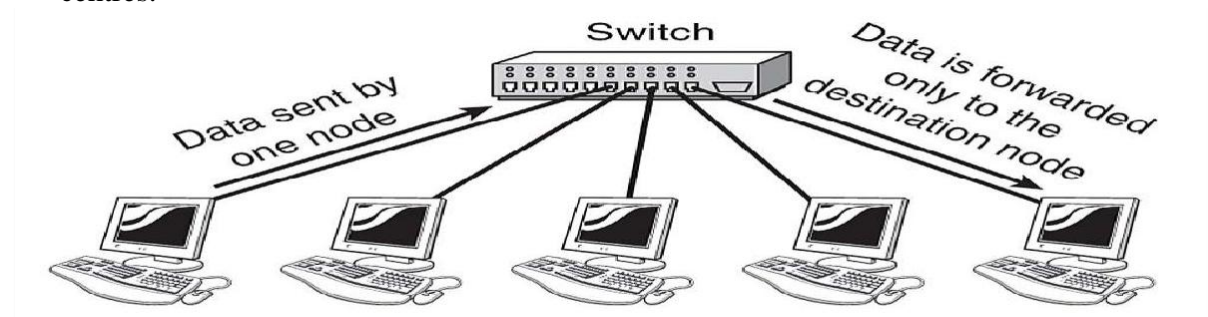


Switch

It is a multiport bridge with a buffer and a design that can boost its efficiency which means a large number of ports imply less traffic and performance. It is a data link layer device which can perform error checking before forwarding data and makes it very efficient as it does not forward packets that have errors and forward good packets selectively to the correct port only. Its main function is to divide the collision domain of hosts but the broadcast domain remains the same.

Types of Switches:

1. Unmanaged Switches: Simple plug-and-play design, no advanced configurations; suitable for small networks.
2. Managed Switches: Advanced configurations (e.g., VLANs, QoS); ideal for large, complex networks with centralized management.
3. Smart Switches: Easier to manage than managed switches; suitable for small- to medium-sized networks.
4. Layer 2 Switches: Operate at the Data Link layer for forwarding data within the same network segment.
5. Layer 3 Switches: Operate at the Network layer, enabling routing between different network segments.
6. PoE Switches: Provide power to devices over Ethernet cables.
7. Gigabit Switches: Support high-speed Gigabit Ethernet connections.
8. Rack-Mounted Switches: Designed for server racks, used in large networks or data centres.
9. Desktop Switches: Compact design for desktops or small office setups.
10. Modular Switches: Customizable and expandable; suitable for large networks and data centres.



Routers

It is a device like a switch that routes data packs based on their IP addresses. The router is mainly a Network Layer device. They mainly normally connect LANs and WANs and have a dynamically updating routing table based on which they make decisions on routing the data packets. The router divides the broadcast domains of the hosts connected through it.



