

## Practical-1

### **Aim : Introduction to cisco packet tracer software network**

#### Access Point

An access point in networking is a device that allows wireless devices, like smartphones and laptops, 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.

- **Advantages:**

- Extends wireless network coverage.
- Allows multiple devices to connect wirelessly.
- Can be placed strategically to eliminate dead zones.

- **Disadvantages:**

- Requires a wired connection to the main network.
- May need multiple access points for large areas.
- Can suffer from interference and signal degradation.

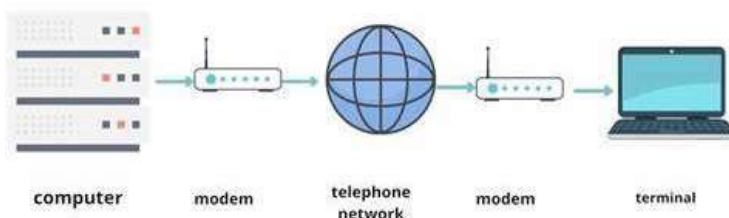


## Modems

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

### **Types of Modems:**

- **Cable Modem:** Sends data through TV cables, providing faster internet than DSL.
- **Wireless Modem:** Connects devices to the internet using Wi-Fi, relying on nearby Wi-Fi signals.
- **Cellular Modem:** Connects to the internet using mobile data from a cellular network, not Wi-Fi or fixed cables.
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- **Advantages:**
  - Essential for internet connectivity.
  - Typically includes built-in routers for added functionality.
- **Disadvantages:**
  - Limited to internet access and not local network management.
  - Performance may vary based on ISP and line quality.



## Firewalls

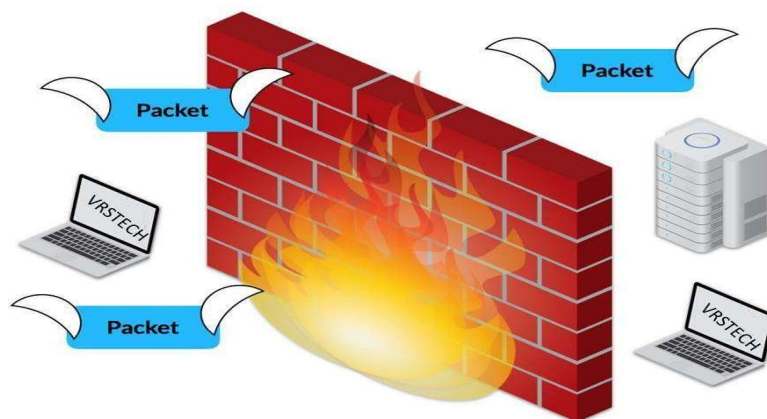
A firewall is a network security device that monitors and controls the flow of data between your computer or network and the internet. It acts as a barrier, blocking unauthorized access while allowing trusted data to pass through. Firewalls help protect your network from hackers, viruses, and other online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

- **Advantages:**

- Provides robust network security.
- Controls incoming and outgoing traffic based on defined rules.
- Protects against unauthorized access and cyber threats.

- **Disadvantages:**

- Can be complex to configure and manage.
- May slow down network performance if not optimized.
- Requires regular updates to maintain security.



## Repeater

A repeater operates at the physical layer. Its main function is to amplify (i.e., 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. When the signal becomes weak, they copy it bit by bit and regenerate it at its star topology connectors following the original strength. It is a 2-port device.

### Advantages

- **Extended Range:** Allows networks to cover larger areas, which is especially useful in large buildings or spread-out locations.
- **Improved Signal Quality:** Enhances weak signals, ensuring better connectivity and performance.
- **Cost-Effective:** Provides an affordable solution for extending network coverage without needing additional infrastructure.

### Disadvantages

- **Limited Functionality:** Only amplifies signals; does not manage traffic or provide security features.
- **Potential Interference:** Can cause interference if placed too close to other wireless devices.
- **Latency:** May introduce slight delays in signal transmission due to the amplification process.

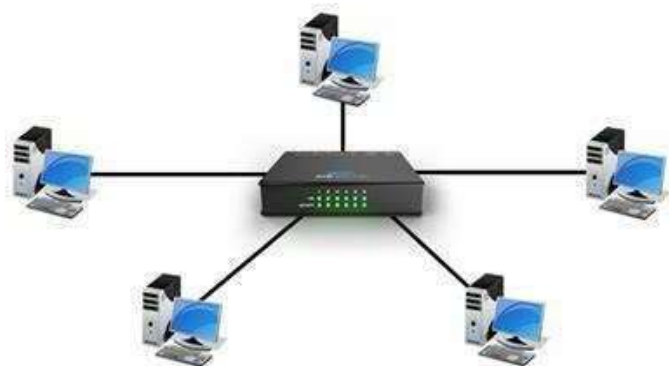


## Hub

A hub is a multiport 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 the hub remains one.

### **Types of Hubs:**

- **Active Hub:** These hubs have their power supply and can clean, boost, and relay the signal along the network. They serve both as a repeater and a wiring center. These are used to extend the maximum distance between nodes.
- **Passive Hub:** These hubs collect wiring from nodes and power supply from the active hub. These hubs relay signals onto the network without cleaning and boosting them and can't be used to extend the distance between nodes.
- **Advantages:**
  - Simple and easy to set up.
  - Cost-effective for small networks.
  - Useful for basic data sharing and connectivity.
- **Disadvantages:**
  - Broadcasts data to all devices, causing network congestion.
  - Less secure, as all devices receive all data packets.
  - Slower performance compared to switches.

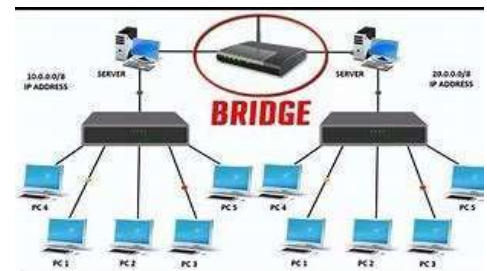


## Bridge

A bridge operates at the data link layer. A bridge is a repeater, with added 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 multiple network segments, with each port connected to a different segment. A bridge is not strictly limited to two ports; it can have multiple ports to connect and manage multiple network segments.

### Types of Bridges:

- **Transparent Bridges:** These bridges make the stations completely unaware of the bridge's existence i.e., whether or not a bridge is added or deleted from the network, reconfiguration of the stations is unnecessary. These bridges make use of two processes i.e., bridge forwarding and bridge learning.
- **Source Routing Bridges:** In these bridges, routing operation is performed by the source station, and the frame specifies which route to follow. The host can discover the frame by sending a special frame called the discovery frame, which spreads through the entire network using all possible paths to the destination.



### Advantages:

- Connects different network segments, improving data flow.
- Reduces network traffic by filtering data.

### Disadvantages:

- Can be complex to configure.
- Limited to connecting similar network types





## Switch

A switch is a multiport bridge with a buffer and a design that can boost its efficiency (a large number of ports imply less traffic) and performance. A switch is a data link layer device. The switch can perform error checking before forwarding data, which makes it very efficient as it does not forward packets that have errors and forwards good packets selectively to the correct port only..

### Types of Switches:

- **Unmanaged Switches:** Simple plug-and-play design and do not offer advanced configuration options. Suitable for small networks or as an expansion to a larger network.
- **Smart Switches:** Have features similar to managed switches but are typically easier to set up and manage. Suitable for small- to medium-sized networks.
- **Layer 2 Switches:** Operate at the Data Link layer of the OSI model and are responsible for forwarding data between devices on the same network segment.

**Layer 3 Switches:** Operate at the Network layer of the OSI model and can route data between different network segments. More advanced than Layer 2 switches and often used in larger, more complex networks.

### • Advantages:

- Reduces network congestion by directly sending data to the intended device.
- Supports high data transfer rates.
- Scalable, allowing for easy expansion of the network.

### • Disadvantages:

- More expensive than hubs.
- Limited to local network connectivity.
- Requires proper configuration for optimal performance.



## **Gateway**

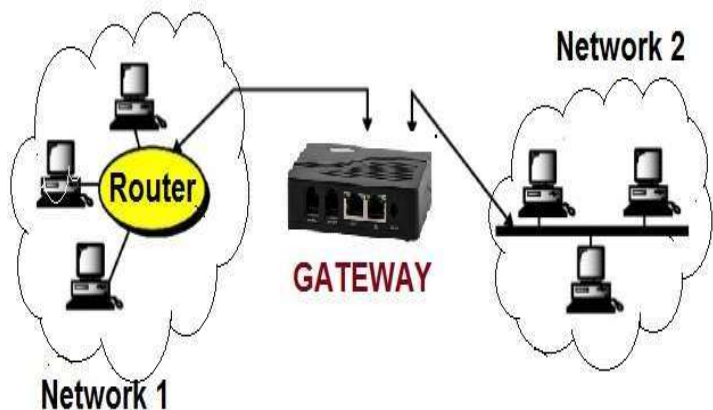
A gateway, as the name suggests, is a passage to connect two networks that may work upon different networking models. They work as messenger agents that take data from one system, interpret it, and transfer it to another system. Gateways are also called protocol converters and can operate at any network layer. Gateways are generally more complex than switches or routers.

### **Advantages:**

- Connects different network types (e.g., LAN to WAN).
- Provides protocol translation.

### **Disadvantages:**

- Can be costly and complex.
- Potential security risks if not properly managed.





## Router

A router is a device like a switch that routes data packets based on their IP addresses. The router is mainly a Network Layer device. Routers 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 hosts connected through it.

- **Advantages:**
  - Efficiently manages network traffic.
  - Provides security features like firewalls and encryption.
  - Supports multiple devices and can offer both wired and wireless connections.
- **Disadvantages:**
  - Can be expensive.
  - Complex setup and configuration.
  - Potential bottlenecks if not properly managed.

