Practical:1 Demonstrate different network devices using CISCO packet tracer.

1. Hub

- A network hub is a node that broadcasts data to every computer or Ethernet-based device connected to it.

- A hub connects multiple wires coming from different branches.

- Hubs are widely used to connect LANs and play a vital role in data transmission and broadcasting.

- Hubs cannot filter data, so data packets are sent to all connected devices.

Types of hubs:

1. Active Hub

- Active hubs are network devices that amplify the incoming signal before passing it to other ports.

- They are also called "smart hubs" and can clean, boost, and relay the signal along with the network.

- Active hubs are expensive in costs as compared to passive hubs.

2. Passive Hub

- Passive hubs are network devices that 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.

- Passive hubs are less expensive in costs as compared to active hubs.

3. Intelligent Hub

- Intelligent Hub can manage clients and isolate errors.

- Intelligent hubs as the name suggests are smarter than active and passive hubs.

- Intelligent hubs work like active hubs but include remote management capabilities.

Image of Hub:

Figure 1: Hub

Advantages of Hub:

- Hubs are relatively cheap compared to switches and other devices in the network.

- Setting up a hub is simple, and minimal configuration is required, making it accessible for non-technical users.

- They have the ability to connect to the network using different physical media.

- They can be used to increase the network distance.

Disadvantages of Hub:

- It increases the chances of collision domains between packets when being transferred from one device to another.
- Hubs broadcast data to all devices, causing unnecessary traffic and decreasing the efficiency.

- They do not have any mechanism for data filtration.

- Hubs waste a lot of bandwidth when transmitting data.
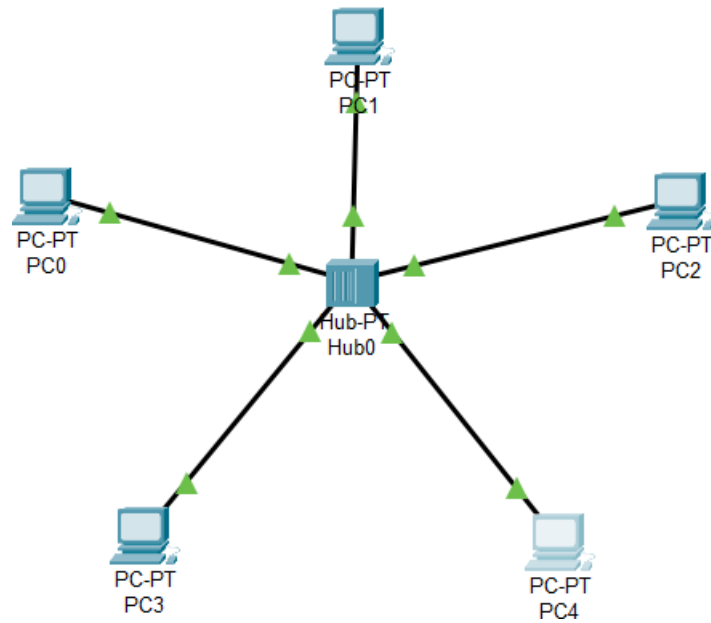
Configuration in Cisco Packet Tracer:

Figure 2: Hub Configuration

2. Router

- A Router is a networking device that operates under the network layer of the OSI model and is used to connect two or more networks.

- It is a device that establishes a common link between networks to enable data flow between them.

- Routers use headers and forwarding tables to determine the best path for forwarding the packets.

- Routers connect two or more logical subnets, which do not necessarily map one-to-one to the physical topology of the network.
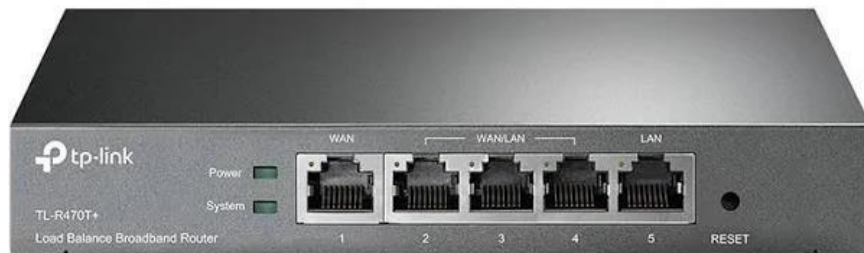
Image of Router:

Figure 3: Router

Advantages of Router:

- Dynamic routing algorithms empower the system to select the most optimal path within the internetwork.

- Routers can filter packets based on IP addresses, enhancing network security.

- The system, through dynamic routing, actively creates collision domains, mitigating network traffic effectively.

- It facilitates connections between different network architectures, promoting interoperability and seamless communication.

Disadvantages of Router:

- Routers are generally more expensive compared to hubs and switches.

- Configuring routers can be complex, especially for non-technical users.

- Routers limit the broadcast domain, which may impact certain types of network applications.

- They have low bandwidth because of their dynamic router communication.

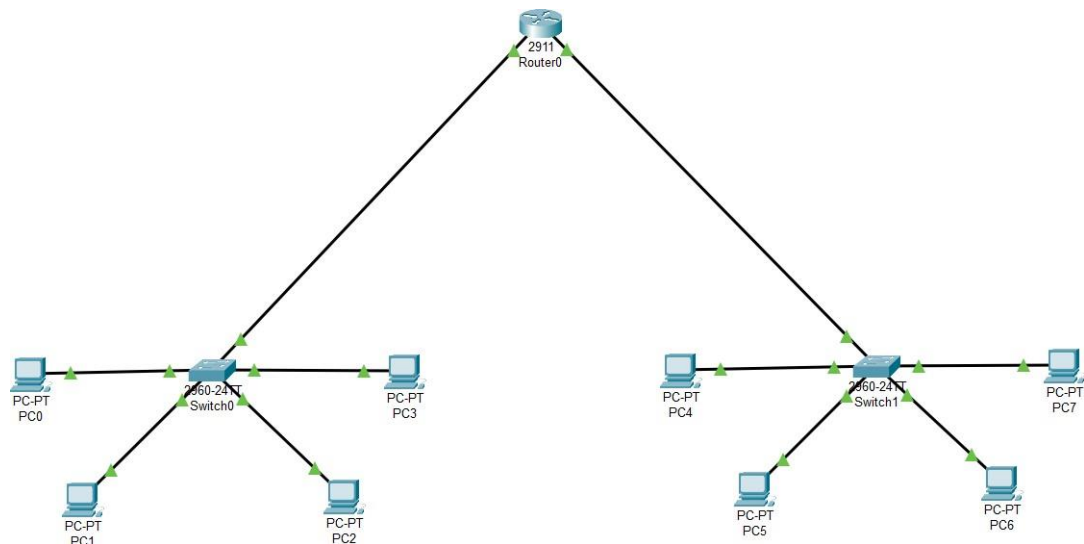**Configuration in Cisco Packet Tracer:**

Figure 4: Router Configuration

3. Switch

- A switch is a multicast networking device that works under the Data link layer of the OSI model and connects a bunch of computers or devices in a network.

- It's mainly used to send a private message and it does not waste data.

- Generally, switches can read the hardware addresses of incoming packets to transmit them to the appropriate destination.

- Switches can also be used to segment a larger network into smaller subnets.

Image of Switch:

Figure 5: Switch

Advantages of Switch:

- It's secure since it delivers data to the specified node.

- It lowers the chances of frame collisions domains.

- Switches learn the MAC addresses of connected devices, allowing for more efficient data forwarding.

- Switches can be easily scaled by adding more ports or connecting multiple switches, making them suitable for growing networks.

Disadvantages of Switch:

- They are more expensive compared to hubs and other devices used in a network.

- Problems may arise when broadcasting traffic.

- Certain switches could be vulnerable to MAC flooding attacks, which may have the potential to affect network performance.

- Advanced switch configurations may require technical expertise due to complexity.
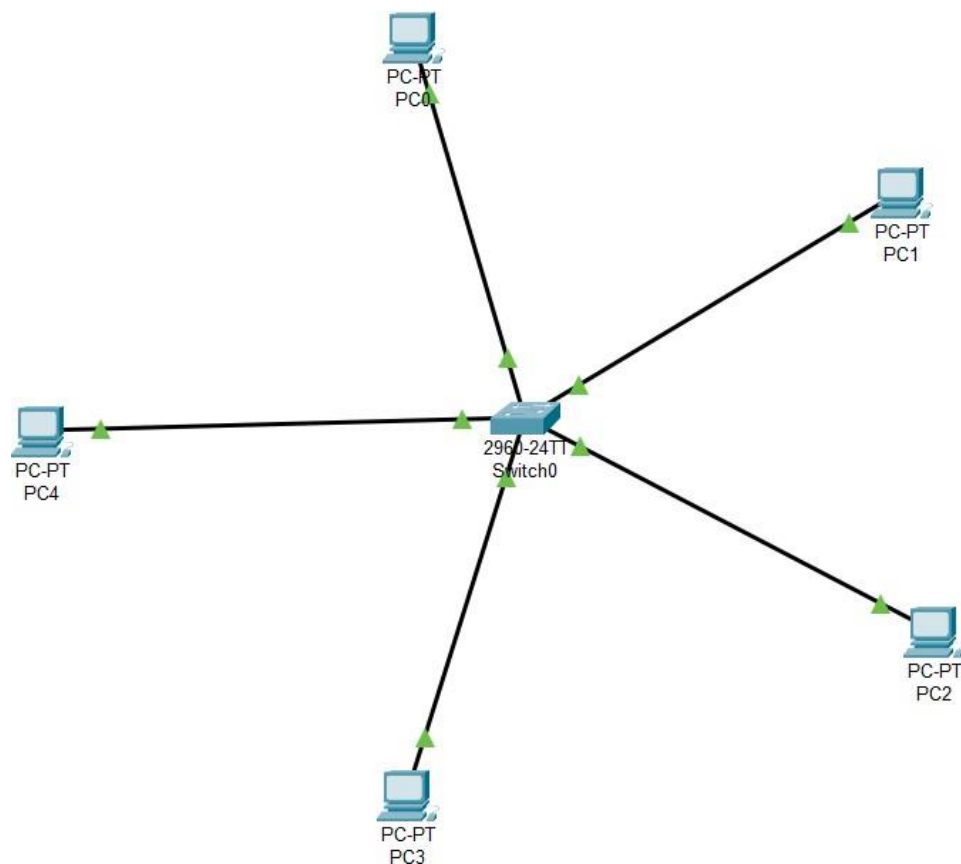
Configuration in Cisco Packet Tracer:

Figure 6: Switch Configuration

4. Bridge

- A bridge operates at the data link layer of the OSI model.

- A bridge is a repeater, with add on functionality of filtering content by reading the MAC addresses of source and destination.

- It is also used for interconnecting two LANs working on the same protocol.

- It has a single input and a single output port, thus making it a 2 port device.

Image of Bridge:

Figure 7: Bridge

Advantages of Bridge:

- It reduces network traffic with minor segmentation.

- Some bridges connect network having different architectures and media types.

- By separating collision domains, bridges enhance overall network performance.

- It creates separate collision domains. Hence, it can increase available bandwidth to individual nodes as fewer nodes share a collision domain.

Disadvantages of Bridge:

- Bridges may not be as scalable as switches in larger network environments.

- Implementing bridges can add complexity to the network architecture.

- Similar to switches and routers, bridges limit the broadcast domain, affecting certain network applications.

- They are slower than repeaters due to the filtering process.
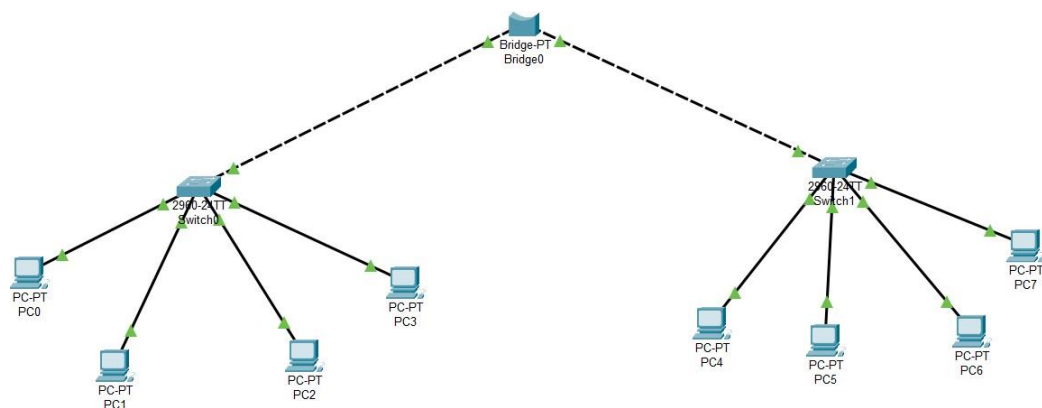
Configuration in Cisco Packet Tracer:

Figure 8: Bridge Configuration

5. Repeater

- A repeater operates at the physical layer of the OSI model.

- Its job is to regenerate the signal over the same network before the signal becomes too weak or corrupted so as to extend the length to which the signal can be transmitted over the same network.

- Repeaters do not amplify the signal.

- It is a 2 port device.

Image of Repeater:

Figure 9: Repeater

Advantages of Repeater:

- Repeaters extend the range of a network.

- Quick deployment and minimal configuration make repeaters user-friendly.

- Repeaters are often cost-effective solutions for extending network coverage.

- Repeaters can be used with various network devices and technologies.

Disadvantages of Repeater:

- Signal degradation risks may arise with excessive use of repeaters in a network.

- With a straightforward function, repeaters lack the features found in more advanced networking devices.

- Dependency on physical media may limit the suitability of repeaters for certain network connections.
- In high-traffic environments, repeaters might struggle to effectively manage network congestion.
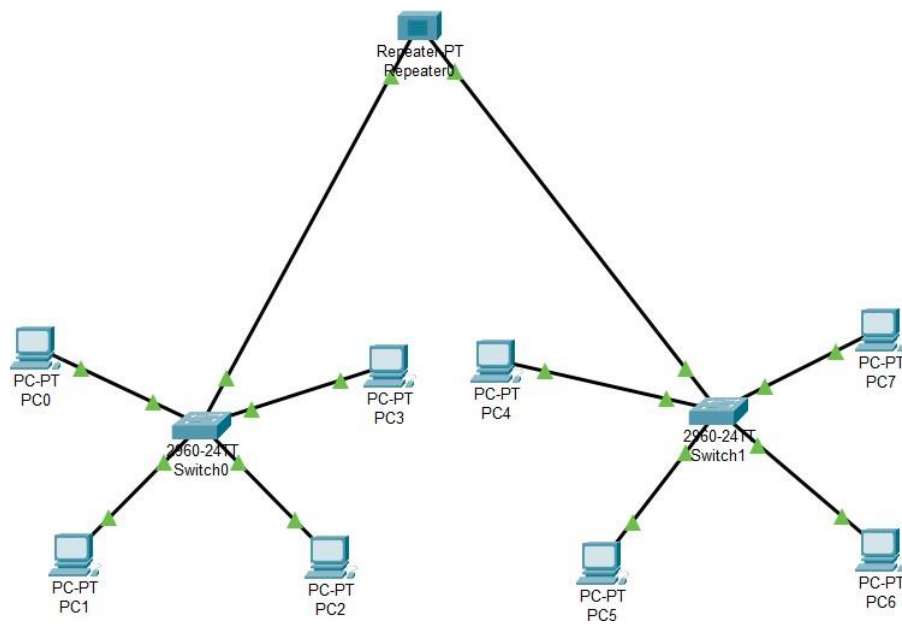
Configuration in Cisco Packet Tracer:

Figure 10: Repeater Configuration