

Experiment No.1

A.1 Aim:

Demonstration of different Network devices with their functionalities.

A.2 Prerequisite:

Switch, Hub, Router, cisco packet tracer

A.3 Outcome:

After successful completion of this experiment students will be able to

Identify various protocols, cables and devices in networking.

A.4 Theory:

Network devices, also known as networking hardware, are physical devices that allow hardware on a computer network to communicate and interact with one another. For example Repeater, Hub, Bridge, Switch, Routers, Gateway, Brouter, and NIC, etc

1. Repeater – A repeater operates at the physical layer. Its job is to 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. An important point to be noted about repeaters is that they not only amplify the signal but also regenerate it. When the signal becomes weak, they copy it bit by bit and regenerate it at its star topology connectors connecting following the original strength. It is a 2-port device.

2. Hub – A hub is a basically 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. Also, they do not have the intelligence to find out the best path for data packets which leads to inefficiencies and wastage.

Types of Hub : Active Hub, Passive Hub, Intelligent Hub

3. Bridge – A bridge operates at the data link layer. A bridge is 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 has a single input and single output port, thus making it a 2 port device.

Types of Bridges

- Transparent Bridges
- Source Routing Bridges

4. 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 forward good packets selectively to the correct port only. In other words, the switch divides the collision domain of hosts, but the broadcast domain remains the same.

5. Routers – 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.

6. 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. A gateway is also called a protocol converter.

7. Brouter – It is also known as the bridging router is a device that combines features of both bridge and router. It can work either at the data link layer or a network layer. Working as a router, it is capable of routing packets across networks and working as the bridge, it is capable of filtering local area network traffic.

8. NIC – NIC or network interface card is a network adapter that is used to connect the computer to the network. It is installed in the computer to establish a LAN. It has a unique id that is written on the chip, and it has a connector to connect the cable to it. The cable acts as an interface between the computer and the router or

modem. NIC card is a layer 2 device which means that it works on both the physical and data link layers of the network model.

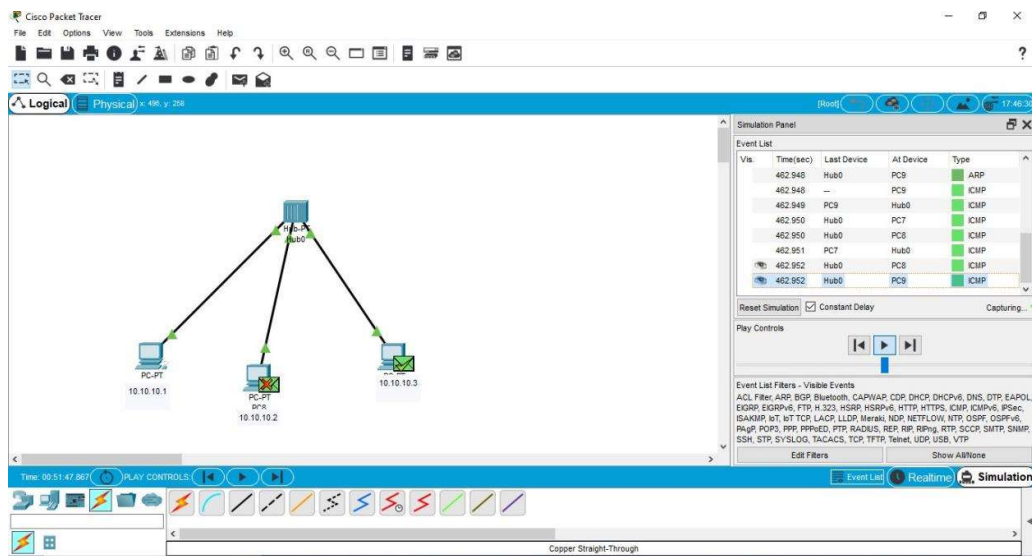
PART B

(PART B : TO BE COMPLETED BY STUDENTS)

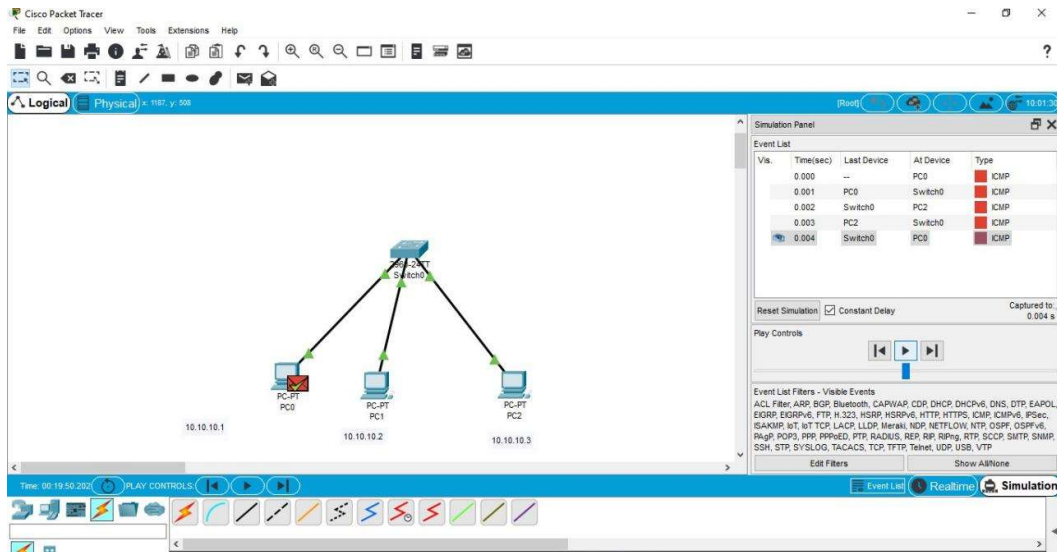
Roll No. A11	Name: Khan Mohammad TAQI
Class : T.E A	Batch : A1
Date of Experiment: 10/07/2024	Date of Submission: 24/07/2024
Grade :	

B.1 Document created by the student:

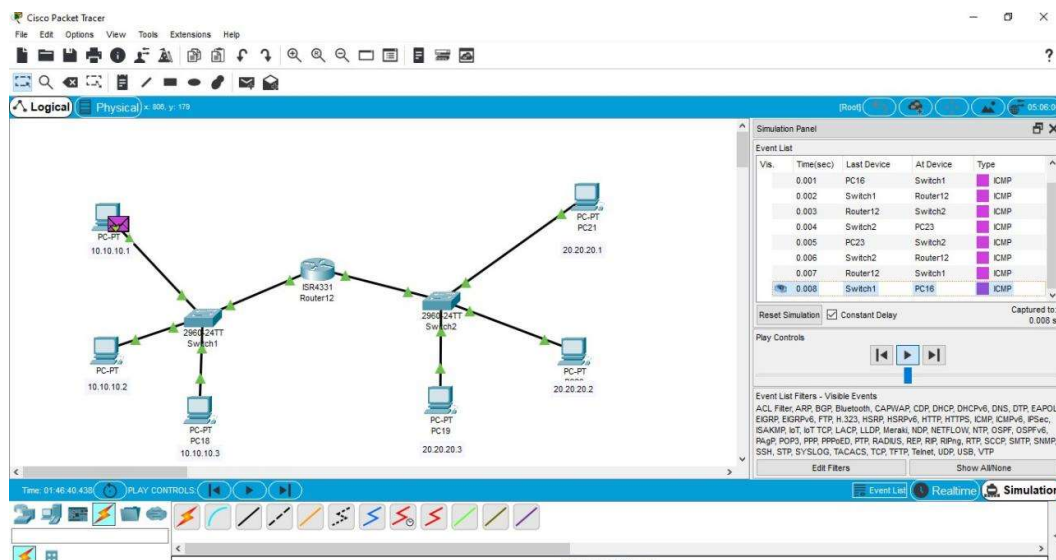
Hub Connection:



Switch Connection:



Router Connection:



B.3 Observations and learning:

Network devices enable communication and interaction on a computer network. A hub, a multi-port repeater, connects multiple wires in a star topology and sends data packets to all connected devices without filtering, maintaining a single collision domain. Hubs can be Active, Passive, or Intelligent. A switch is a multiport bridge with enhanced performance, operating at the data link layer, performing error checks, and forwarding only error-free packets. It divides the collision domain while maintaining the same

broadcast domain. A router routes data packets based on IP addresses, operating primarily at the network layer, connecting LANs and WANs, and using dynamic routing tables to divide broadcast domains.

B.4 Conclusion:

The experiment demonstrated the functionalities of various network devices, including repeaters, hubs, bridges, switches, routers, gateways, brouters, and NICs. Each device operates at different layers of the OSI model and serves unique purposes in network communication.

B.5 Question of Curiosity

(To be answered by student based on the practical performed and learning/observations)

Q1: What is the difference manageable and unmanageable switch?

Ans. Manageable Switch:

- Configuration: Can be configured to adjust settings, control network traffic, and prioritize network traffic.
- Management: Allows for remote management via interfaces such as web-based GUIs, command-line interfaces (CLI), or Simple Network Management Protocol (SNMP).
- Features: Offers advanced features like VLANs, Quality of Service (QoS), port mirroring, and redundancy protocols (e.g., Spanning Tree Protocol).
- Security: Provides enhanced security options such as port security, access control lists (ACLs), and 802.1X authentication.
- Monitoring: Supports network monitoring and troubleshooting tools to analyze traffic and identify issues.
- Scalability: Better suited for larger, more complex networks that require greater control and flexibility.

Unmanageable Switch:

- Configuration: Plug-and-play with no configuration options. Works with default settings.
- Management: No remote management capabilities.
- Features: Basic functionality with limited or no advanced features.
- Security: Minimal security features.
- Monitoring: Lacks network monitoring and troubleshooting tools.
- Scalability: Ideal for small, simple networks with basic connectivity needs.

Q2: What is the difference between L2 and L3 switch?

Ans. Layer 2 (L2) Switch:

- Operating Layer: Operates at the Data Link Layer (Layer 2) of the OSI model.
- Functionality: Primarily concerned with switching frames based on MAC addresses.
- Forwarding Method: Uses MAC addresses to determine the destination of frames.
- VLAN Support: Supports VLANs to segment network traffic.
- Broadcast Domains: Does not break up broadcast domains.
- Routing: Does not perform IP routing; relies on routers for inter-VLAN routing.

Layer 3 (L3) Switch:

- Operating Layer: Operates at the Network Layer (Layer 3) of the OSI model.
- Functionality: Combines switching (based on MAC addresses) and routing (based on IP addresses).
- Forwarding Method: Uses both MAC addresses for switching and IP addresses for routing.

- VLAN Support: Supports VLANs and can perform inter-VLAN routing.
- Broadcast Domains: Breaks up broadcast domains, reducing broadcast traffic.
- Routing: Performs IP routing, allowing for faster communication between different VLANs and subnets.

Q3: List Layer 2 devices and Layer 3 devices.

Ans. Layer 2 Devices:

- Switches: Primarily operate at the data link layer, forwarding frames based on MAC addresses.
- Bridges: Used to connect and filter traffic between different segments of a LAN.
- Network Interface Cards (NICs): Enable devices to connect to a network and operate at both the physical and data link layers.
- Hubs: Simple network devices that connect multiple Ethernet devices, making them act as a single network segment.

Layer 3 Devices:

- Routers: Forward data packets between different networks based on IP addresses.
- Layer 3 Switches: Combine the functions of switches and routers, providing both switching (based on MAC addresses) and routing (based on IP addresses).
- Brouters: Devices that can function both as bridges (at Layer 2) and routers (at Layer 3).