Experiment1.4

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Subject Name: Computer Networks **Subject Code: 22-CSH-312**

1. **Aim:** Configure and Understand working of network devices Hub, Switch, Routers

2. **Requirements(Hardware/Software):**

   S/W Requirement :- Packet Tracer
   H/W Requirement :-
   • Processor – Any suitable Processor e.g. Celeron
   • Main Memory - 128 MB RAM
   •Hard Disk – minimum 20 GB IDE Hard Disk
   • Removable Drives–1.44 MB Floppy Disk Drive
   –52X IDE CD-ROM Drive
   •PS/2 HCL Keyboard and Mouse

3. **Theory:**

   1. Hub: A Hub is a basic networking device that connects multiple devices in a network. It operates at the physical layer (Layer 1) of the OSI model. When a data packet is received on one port of the Hub, it is broadcasted to all other ports, regardless of the intended destination. This makes Hubs inefficient for larger networks as it can lead to collisions and unnecessary traffic.

   2. Switch: A Switch operates at the data link layer (Layer 2) of the OSI model. It connects devices within a network and uses MAC addresses to

forward data only to the intended recipient. Unlike a Hub, a Switch only sends data to the specific device that needs it, which reduces network congestion and improves performance.

3. Router : A Router is a network device that operates at the network layer (Layer 3) of the OSI model. It is used to connect multiple networks together and route data from one network to another. Routers use IP addresses to determine the best path for forwarding packets to their destination. They can also perform network address translation (NAT) and provide firewall functions.

4. Protocol: In networking, a protocol is a set of rules and conventions that govern how data is transmitted over a network. Examples include TCP/IP, HTTP, and FTP. Protocols ensure that data is sent, received, and interpreted correctly between devices on a network.

4. Procedure:

1. Attach Required Devices in Packet Tracer:
   - Open Packet Tracer and add the necessary network devices such as a Hub, Switch, and Router. Connect these devices using appropriate cables (e.g., straight-through cables for different devices or crossover cables for similar devices). Arrange them according to the network design you plan to simulate.

2. Assign IP Addresses to Devices:
   - Click on each device to configure it. For routers and switches, assign IP addresses to their interfaces. For end devices (e.g., computers), assign an IP address, subnet mask, and default gateway. This step ensures that each device can communicate within the network.

3. Select Source and Destination and Drop Packet:

- Choose a source device (e.g., a computer) and a destination device (e.g., another computer or server) within the network. Use the "Add Simple PDU" tool in Packet Tracer to send a data packet from the source to the destination.

4. Go to Simulation Mode and Click Capture/Play:

- Switch Packet Tracer to Simulation mode, which allows you to view the data packet's journey through the network. Click on the "Capture/Play" button to start the simulation. Observe how the packet travels from the source device, through the network devices, to the destination device.

5. Observe the Simulation:

- As the simulation runs, monitor how each device (Hub, Switch, Router) handles the packet. Notice how the Hub broadcasts the packet to all devices, the Switch forwards it only to the intended recipient based on MAC addresses, and the Router directs it based on IP addresses. The packet will eventually reach the destination, demonstrating the function of each device.
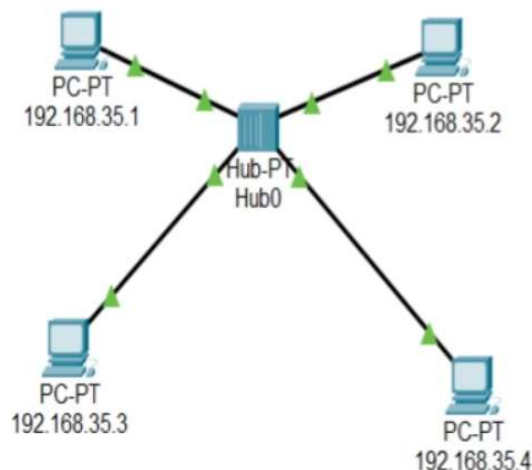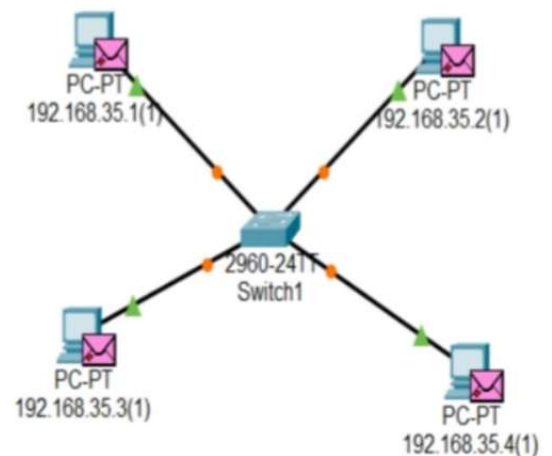
5. Output:

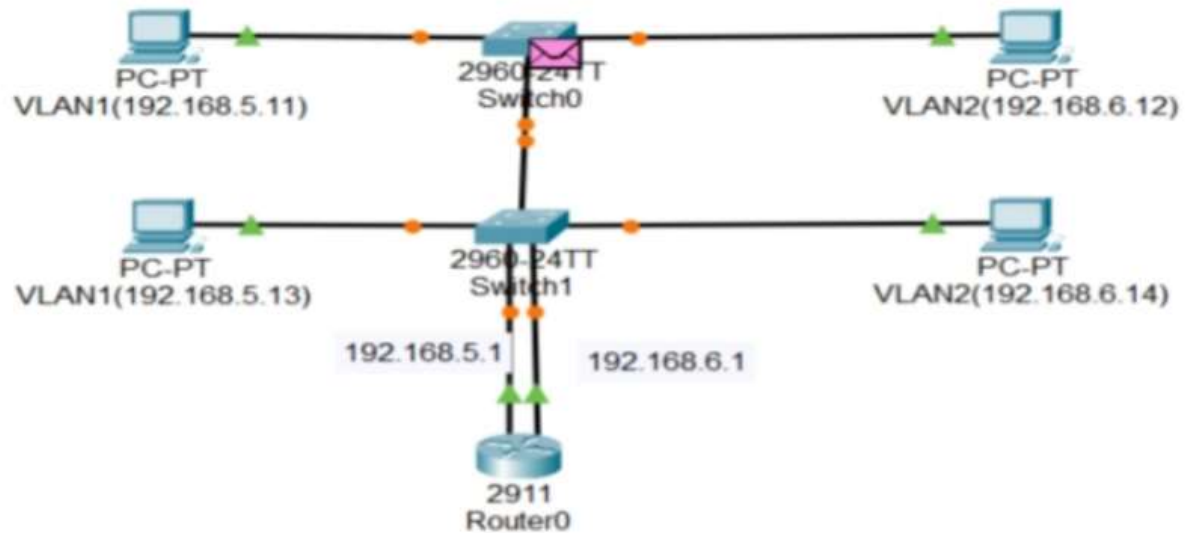Fig 1. Hub Connectivity   Fig 2. Switch Connectivity

Fig 3. Router Connectivity

6. Learning Outcome:

1. Understanding of Network Device Functions: Students will learn the specific roles and functions of Hubs, Switches, and Routers within a network.

2. IP Address Configuration: Students will gain practical experience in assigning and configuring IP addresses for network devices.

3. Data Transmission Process: Students will understand how data packets are transmitted across a network and how different devices handle this process.

4. Network Simulation Skills: Students will develop the ability to use Packet Tracer for simulating and analyzing network operations.

5. Comparison of Network Devices: Students will be able to differentiate between the behaviours of a Hub, Switch, and Router in handling network traffic.