Department of Computer Science and Engineering

Islamic University of Technology (IUT)

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Laboratory Report

CSE 4412: Data Communication and Networking Lab

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Section	**: 1**
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Lab No	**: 3**

Title: Create a simple basic LAN (Local Area Network)

Objective:

1. Create a simple LAN by connecting multiple end devices.
2. Significance of IP address
3. Difference between Switch and Hub.
4. Configure the given topology (see .pkt file in the attachment) to create LAN.

Devices/ software Used: Cisco Packet Tracer: 12 PCs, 2 Hubs, 1 Switch.

Working Procedure:

1. Provided a packet file, where there were 3 rooms. Room 1 and 2 had 4 PCs and a Hub each. Room 3 only had the 4 PCs. There was also a central switch using which a simple Local Area Network (LAN) had to be built.
2. Connecting the PCs with the Hub in Room 1 and 2 using copper straight through wiring, the PCs in Room 3 with the switch using copper straight-through wiring, and the Hubs in Room 1 and 2 with the Switch using cross-over wiring all the while choosing the proper Ethernet Ports.
3. After successfully wiring the Network, the Hubs and switches have to be turned on.
4. Then, all the end device (PCs) have to be assigned an IP address. The IP sequence chosen for this lab task was 192.168.0.X. Assigning any values between 1-254 for each PC will generate unique IP Address. The subnet mask is automatically generated for all the devices as 255.255.255.0. This ensures the same Network ID for all the devices connected in the network.
5. After clicking on one of the end devices, and going to Desktop Settings, the command prompt is opened. There, the IP configurations of that device can be checked by using the command “ipconfig”. To send a packet to another PC, the command ping <IP Address> can be used. Example: “ping 192.168.0.2”.
6. Creating different scenarios for the different rooms present. A scenario is created for the following ping commands:
    a. A PC in Room 1 to a PC in Room 3.
    b. A PC in Room 2 to a PC in Room 2.
    c. A PC in Room 3 to a PC in Room 2.
    d. A PC in Room 3 to a PC in Room 3.

Diagram of the experiment:

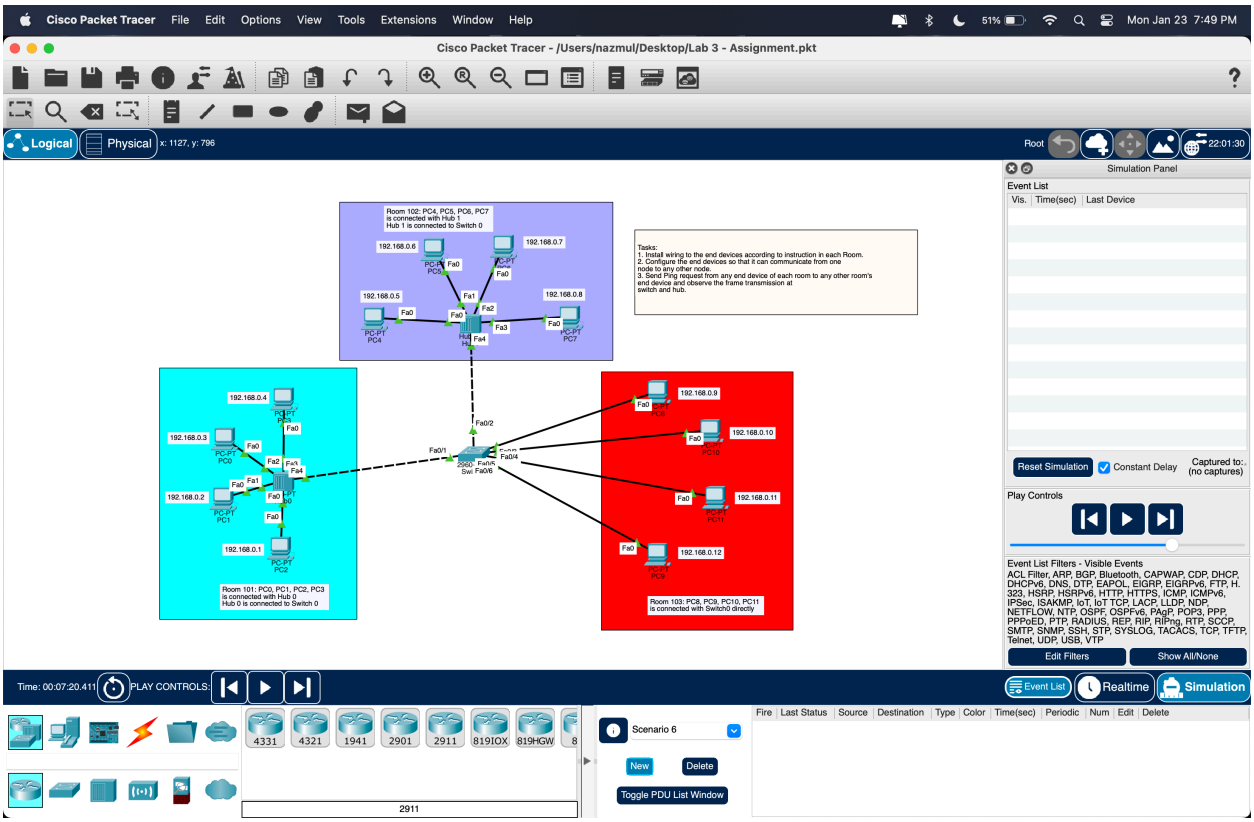

Fig : Wiring and IP Configuration of Devices

Observation:

The following observations were made for the provided scenarios:

a. A PC in Room 1 (192.168.0.1) to a PC in Room 3 (192.168.0.12).

The PC1 sent a packet setting the IP address destination and MAC address of PC12 towards the Hub. The Hub repeated that packet towards every device connected with it (except the device sending the packet), including the PCs and the Switch. All the PCs rejected the packet and the Switch then accurately routed the device toward the PC12 in Room 3 where the packet was being pinged. The switch accurately mapped the MAC address from the ARP table and found the device was in the same network. PC12 then returned a reply setting the IP address destination and MAC address of PC1 to the switch, which routed that reply to the Hub in Room 1 accurately. The Hub repeated the reply to every end device connected with it. All the PCs rejected it, except the PC1 for which the reply was meant. PC1 accepted the reply. This repeats 4 times.

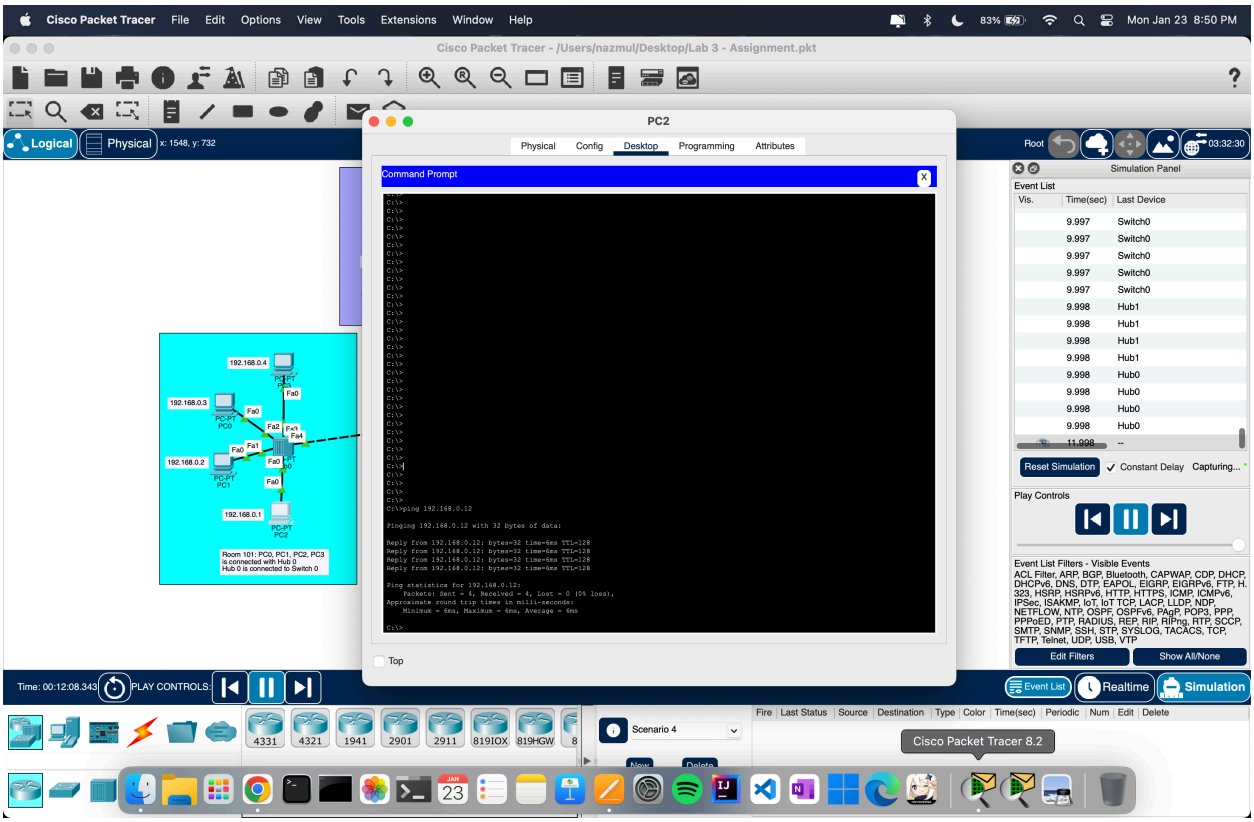

Fig: Send and Receives 4 packets

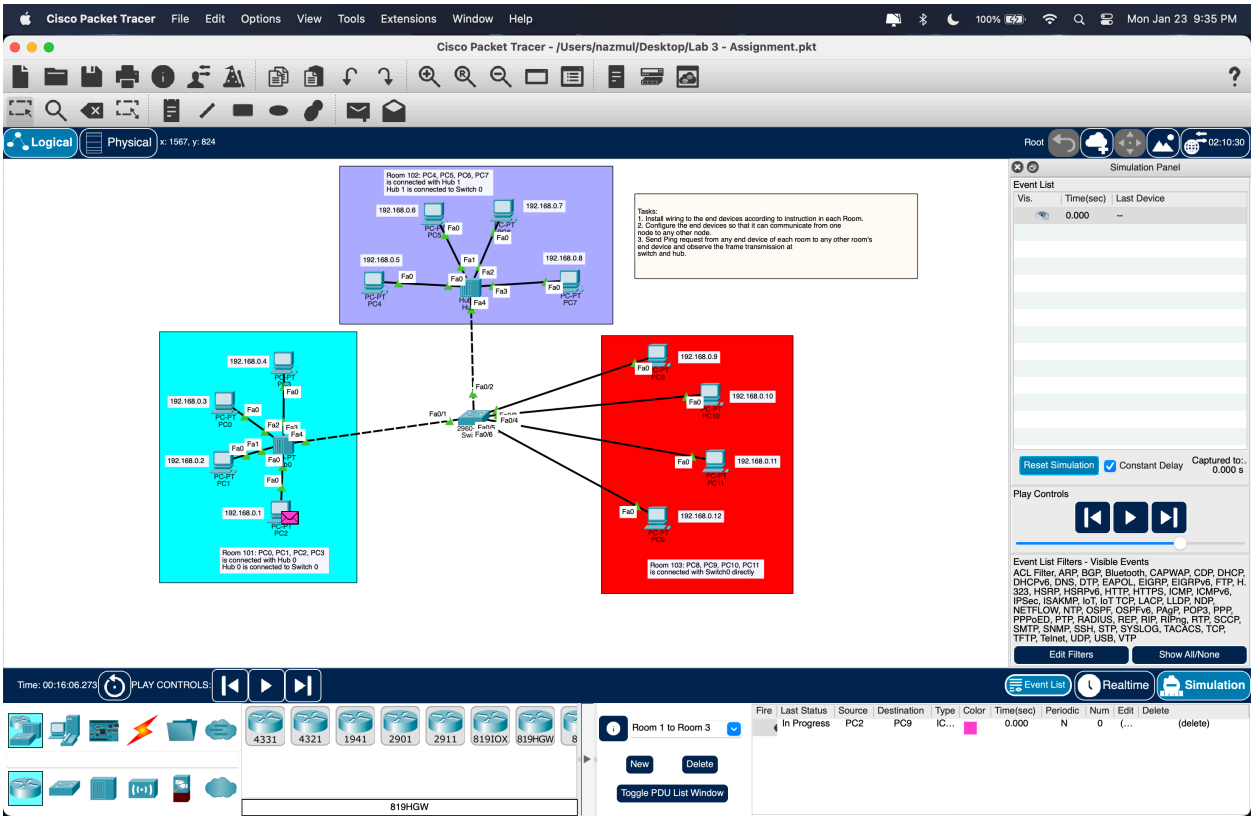

Fig: Creates packet

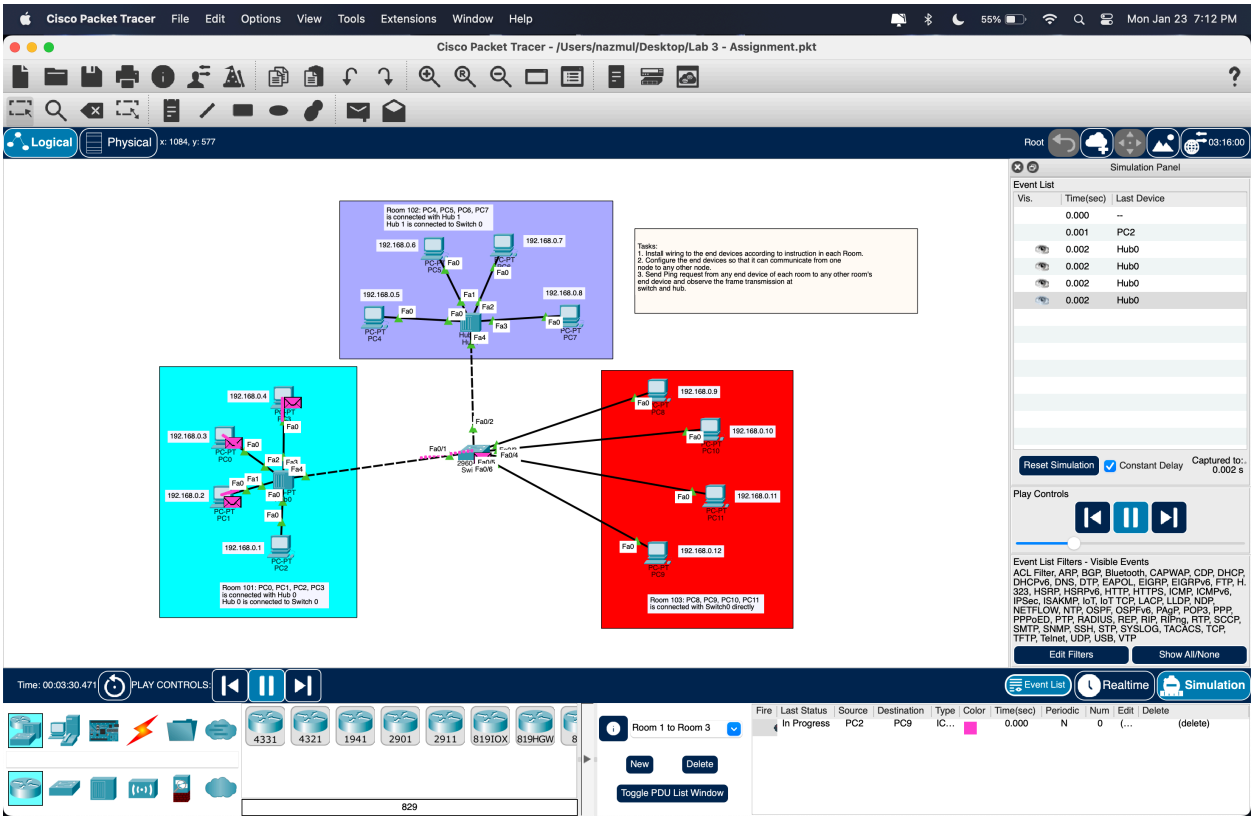

Fig: Hub repeats packet to all devices connected to it

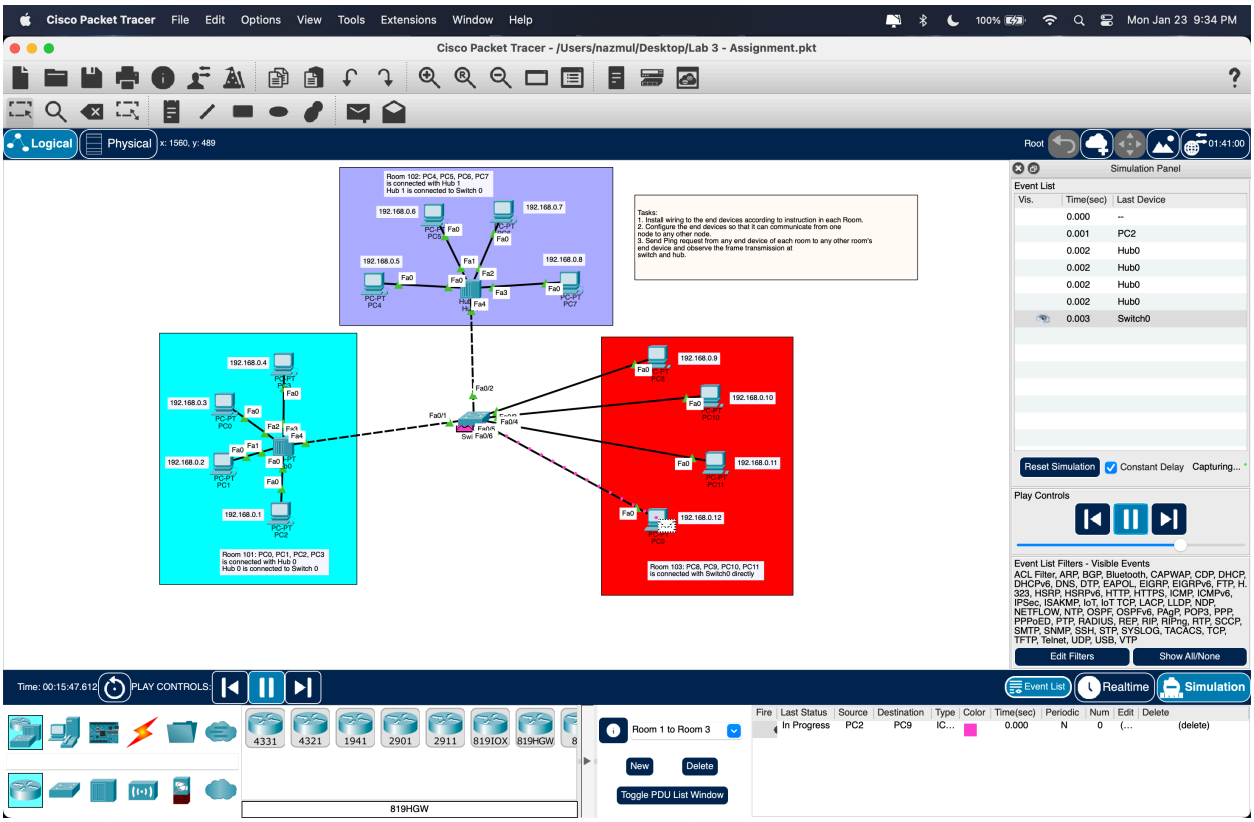

Fig: Switch Accurately sends packet to only destination PC

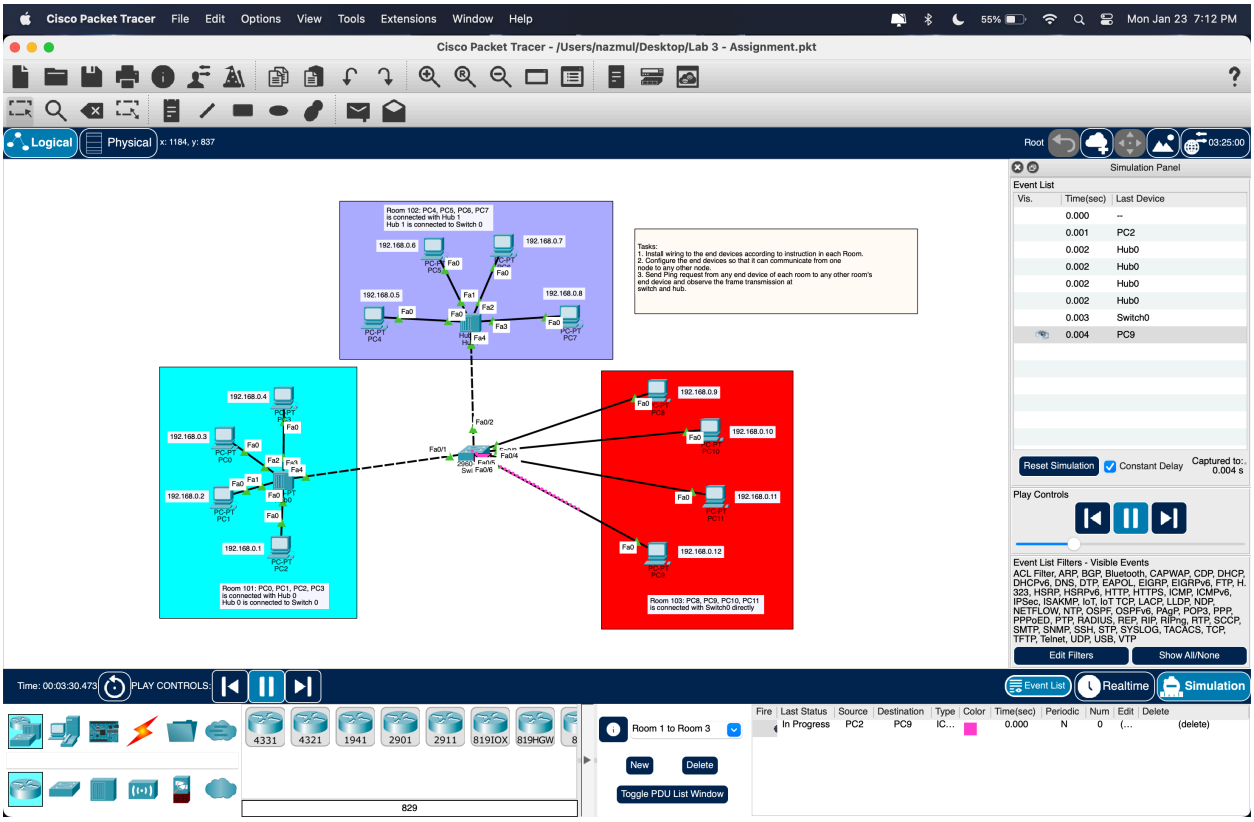

Fig: Sends a reply to Src PC now Destination PC

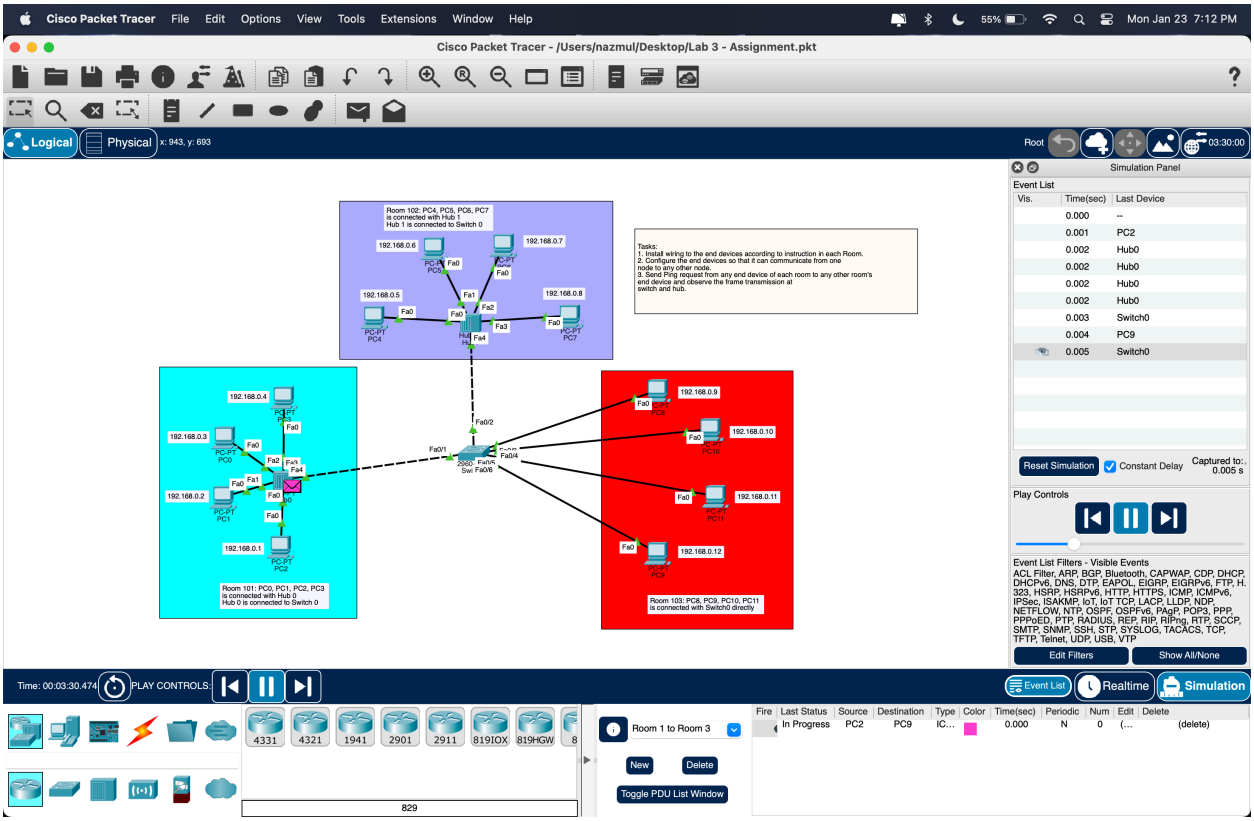

Fig: Switch Accurately sends packet to Room 1

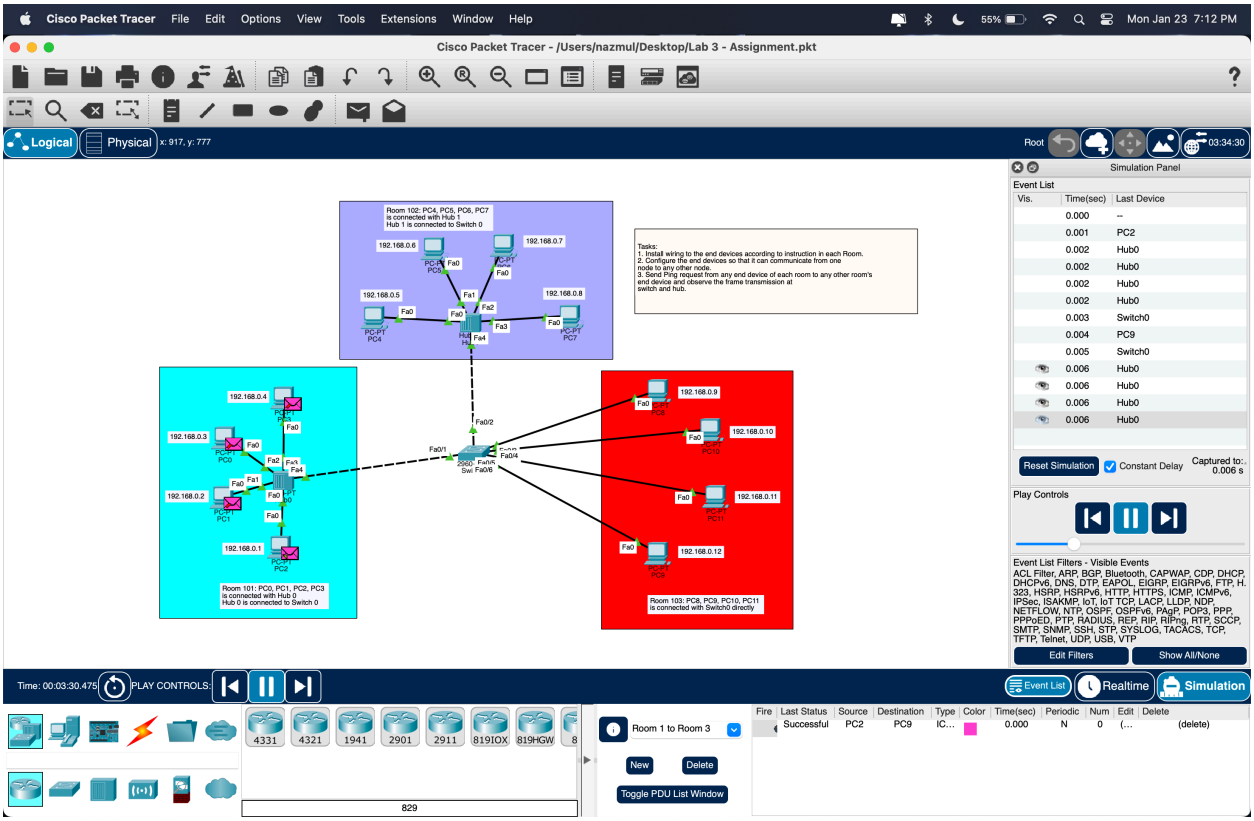

Fig: Hub repeats to all devices. Only Destination PC accepts.

b. A PC in Room 2 (192.168.0.5) to a PC in Room 2 (192.168.0.8).
The PC5 sent a packet towards the Hub setting the IP address destination and MAC address of PC8. The Hub repeated that packet towards every device connected with it (except the device sending the packet), including the PCs and the Switch. All the PCs other than PC8 and the switch rejected the packet because the incoming and outgoing port are the same. PC8 accepted it and similarly sent back a reply. This repeats 4 times.

c. A PC in Room 3 (192.168.0.12) to a PC in Room 2 (192.168.0.8).
The PC12 sent a packet directly towards the switch setting the IP address destination and MAC address of PC8. The switch accurately mapped the MAC address from the ARP table and found the device was in the same network. It routed the reply towards the Hub in Room 2. The Hub then repeated the packet toward every PC connected to it. Only PC8 accepted the packet and the rest rejected it. The PC8 then sent back a reply toward the Hub setting the address destination and MAC address of PC12. The Hub repeated the reply to every device connected to it, including the PCs and the switch. Using the IP Address and Subnet mask, the switch realized the PC was under the same network. Matching with the ARP Table, the switch identified the MAC address of the PC12 and sent it directly towards it, which it accepted. This repeats 4 times

d. A PC in Room 3 (192.168.0.12) to a PC in Room 3 (192.168.0.9).
The PC12 sent a packet directly towards the switch setting the IP address destination and MAC address of PC9. The switch received the frame and deduced the PC is under the same network from the IP address and subnet mask. The switch checks the ARP table to find the MAC address of PC9 matching, and sends the packet towards it. Similarly PC9 sends back a reply towards PC12. This is repeated 4 times.

- **Significance of IP address configuration to different end devices:**

The IP address configuration at each end device had to be different. All the devices connected in a network has to have the same Network ID. The subnet was was set as 255.255.255.0 by default by Cisco Packet Tracer. This meant, the IP address of the all the end devices had to have the same numbers for the first 3 numbers. The last number couldn't be the same, because in the same network, the IP address couldn't be the same. So, for this network, the IP address configuration followed was 192.168.0.X. Here, the value for X could be anything between 0-255 except 0 and 255. Essentially, the IP addresses are the identifiers that allow information to be sent between devices on a network

- **Difference between Switch and Hub:**

The Hub transmits the signal to all the ports (except the port which sends the signal). This means all the end devices connected to the Hub will receive a packet, even if it isn't addressed to them, when a devices connected to the hub sends or receives a packet. Hub operates on the Physical Layer. It can be used as a repeater to maintain the strength of the signal. Hubs are comparatively cheaper.

The Switch enables connection between different devices in a network. Switches have a packet filtering feature, where it matches where the packet must be sent using the port, matches the MAC address from the ARP table etc to accurately route the packet. It operates on the Data Link Layer. Switches are quite expensive, and used in formation of Networks.

Challenges:

The instructions in the lab was not clear, whether we should use ping mechanism or the PDU mechanism. I decided to use the ping method. How the switch accurately chooses where to send the packets was a bit unclear, but upon further inspection, it uses the IP address and the MAC address and the ARP table to identify where to send packets accurately.