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CEL 51, DCCN, Monsoon 2020
Lab 3: Learn usage of Packet Tracer

Objectives

- Install Packet Tracer from https://www.ciscopods.com/install-packet-tracer-ubuntu/
- Develop an understanding of the basic functions of Packet Tracer.
- Create/model a simple Ethernet network using two hosts and a hub.
- Observe traffic behavior on the network.
- Observer data flow of ARP broadcasts and pings.

Step 1: Create a logical network diagram with two PCs and a hub

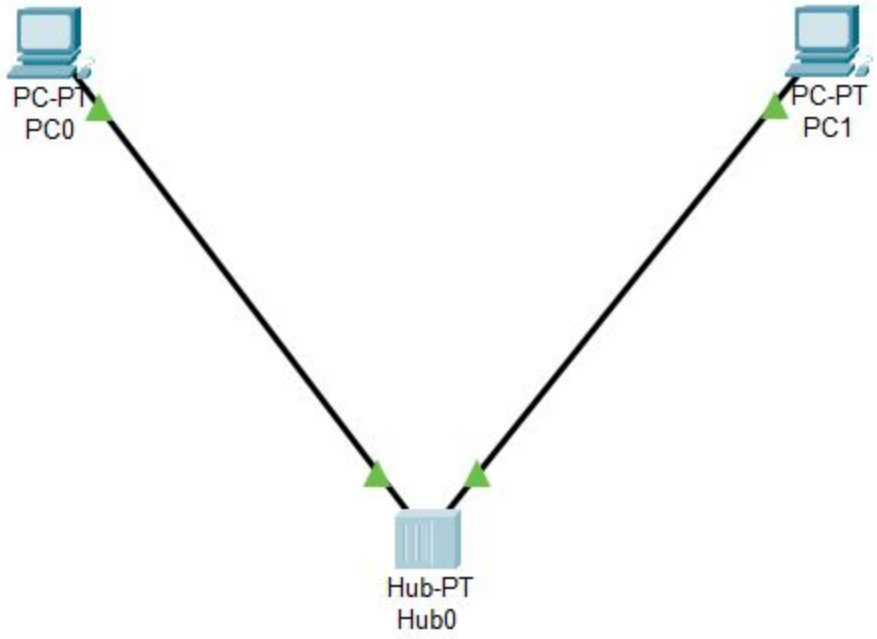
The bottom left-hand corner of the Packet Tracer screen displays eight icons that represent device categories or groups, such as Routers, Switches, or End Devices.

Moving the cursor over the device categories will show the name of the category in the box. To select a device, first select the device category. Once the device category is selected, the options within that category appear in the box next to the category listings. Select the device option that is required.

a) Select **End Devices** from the options in the bottom left-hand corner. Drag and drop two generic PCs onto your design area.
b) Select **Hubs** from the options in the bottom left-hand corner. Add a hub to the prototype network by dragging and dropping a generic hub onto the design area.
c) Select **Connections** from the bottom left-hand corner. Choose a **Copper Straight-through** cable type. Click the first host, **PC0**, and assign the cable to the **FastEthernet** connector. Click the hub, **Hub0**, and select a connection port, **Port 0**, to connect to **PC0**.
d) Repeat Step c for the second PC, **PC1**, to connect the PC to **Port 1** on the hub.

*There should be green dots at both ends of each cable connection. If not, check the cable type selected.

Outcome :

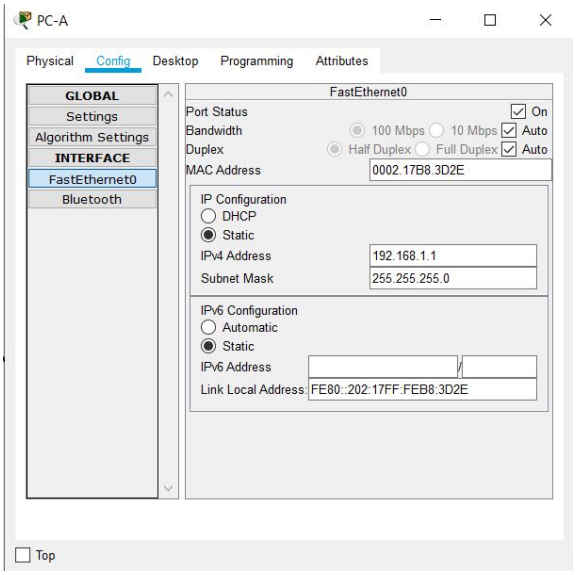


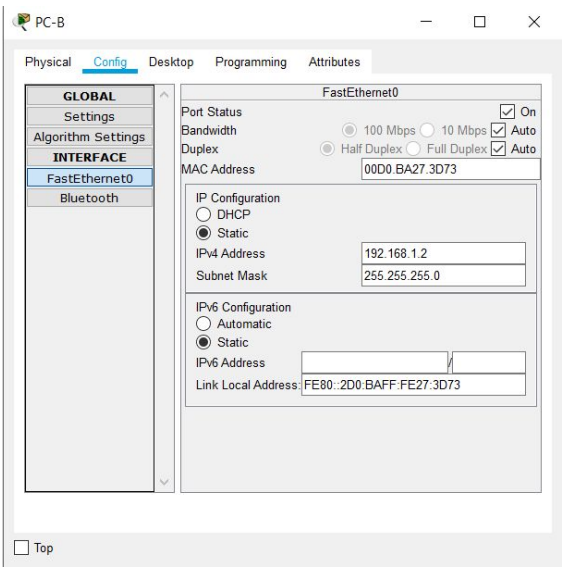
The image shows the outcome of step 1. In this step, a network of two generic personal computers and a generic hub is created and the computers are connected to the hub by means of a Copper straight-through cable. This creates a small Ethernet network with a copper medium for the ethernet cable.

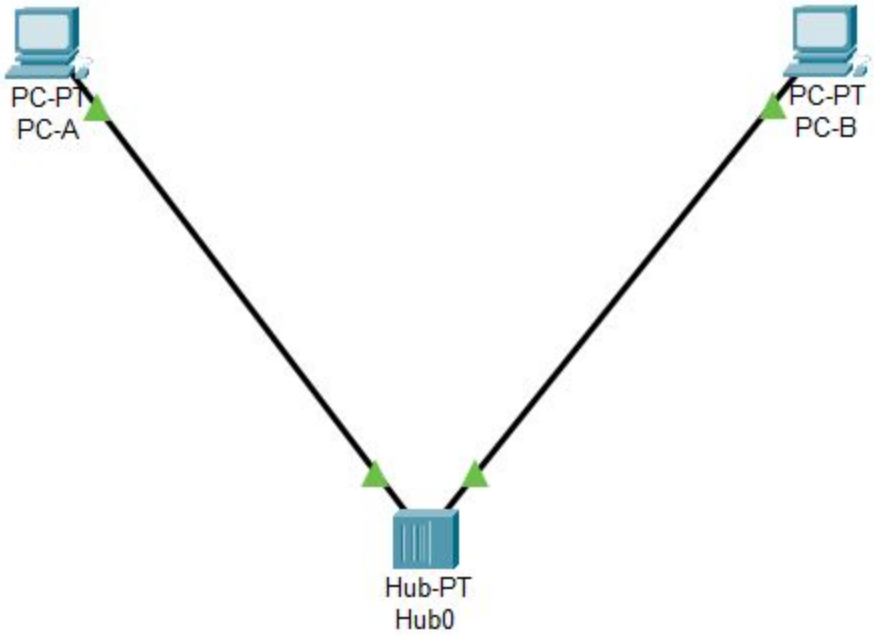
Step 2: Configure host names and IP addresses on the PCs

a) Click PC0. A PC0 window will appear.
b) From the PC0 window, select the **Config** tab. Change the PC **Display Name** to **PC-A**. (An error message window will appear warning that changing the device name may affect scoring of the activity. Ignore this error message.) Select the **FastEthernet** tab on the left and add the IP address of **192.168.1.1** and subnet mask of **255.255.255.0**. Close the PC-A configuration window by selecting the **x** in the upper righthand corner.
c) Click PC1.
d) Select the **Config** tab. Change the PC **Display Name** to **PC-B**. Select the **FastEthernet** tab on the left and add the IP address of **192.168.1.2** and subnet mask of **255.255.255.0**. Close the PC-B configuration window.

Outcome :







The above images show the configuration of both the personal computers (PC-A and PC-B) and the way they are connected to a hub in a simple Ethernet network. The IP addresses and subnet masks assigned to each PC is also shown along with the period separated hexadecimal notation for MAC (Physical) address of both the personal computers which is automatically assigned to them.

Step 3: Observe the flow of data from PC-A to PC-B by creating network traffic

a) Switch to **Simulation** mode by selecting the tab that is partially hidden behind the **Realtime** tab in the bottom right-hand corner. The tab has the icon of a stopwatch on it.

b) Click the **Edit Filters** button in the **Edit List Filters** area. Clicking the **Edit Filters** button will create a pop-up window. In the pop-up

window, click the **Show All/None** box to deselect every filter. Select just the **ARP** and **ICMP** filters.

c) Select a **Simple PDU** by clicking the closed envelope on the right vertical toolbar. Move your cursor to the display area of your screen. Click **PC-A** to establish the source. Move your cursor to **PC-B** and click to establish the destination.

   **Notice that two envelopes are now positioned beside PC-A. One envelope is ICMP, while the other is ARP. The Event List in the Simulation Panel will identify exactly which envelope represents ICMP and which represents ARP.

d) Select **Auto Capture / Play** from the **Play Controls** area of the Simulation Panel. Below the **Auto Capture / Play** button is a horizontal bar, with a vertical button that controls the speed of the simulation. Dragging the button to the right will speed up the simulation, while dragging is to the left will slow down the simulation.

e) The animation will run until the message window *No More Events* appears. All requested events have been completed. Select OK to close the message box.

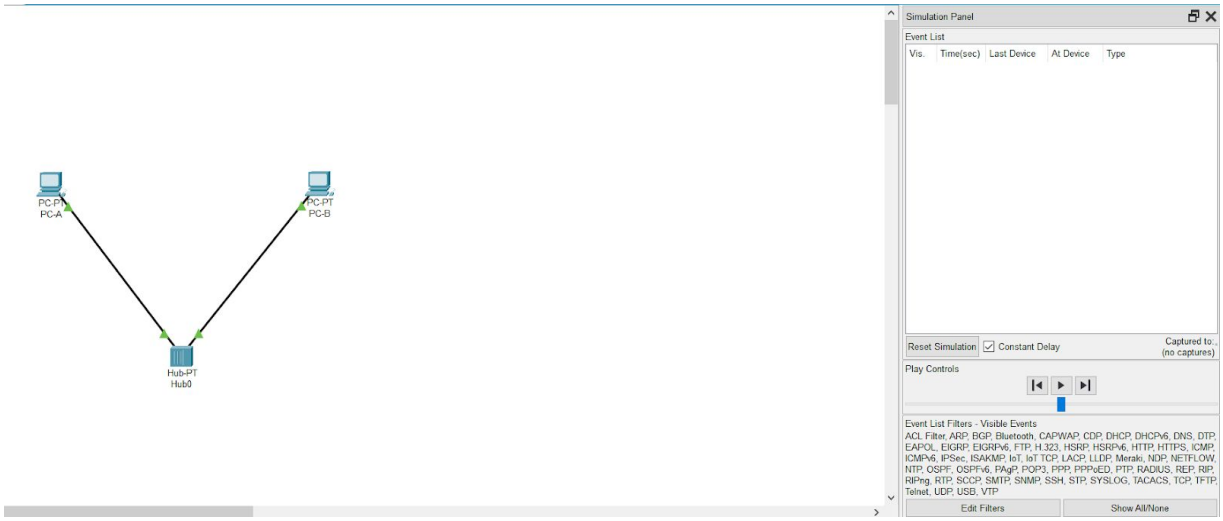
f) Choose the **Reset Simulation** button in the Simulation Panel. Notice that the ARP envelope is no longer present. This has reset the simulation but has not cleared any configuration changes or dynamic table entries, such as ARP table entries. The ARP request is not necessary to complete the **ping** command because PC-A already has the MAC address in the ARP table.

g) Choose the **Capture / Forward** button. The ICMP envelope will move from the source to the hub and stop. The **Capture / Forward** button allows you to run the simulation one step at a time. Continue selecting the **Capture / Forward** button until you complete the event.

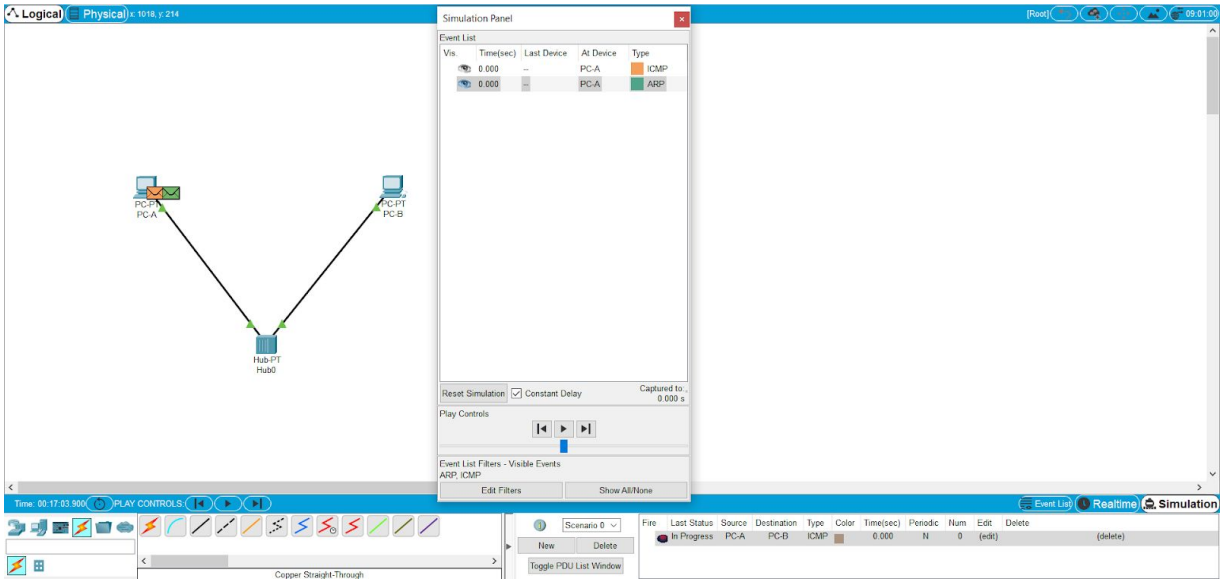
h) Choose the **Power Cycle Devices** button on the bottom left, above the device icons.

i) An error message will appear asking you to confirm reset. Choose **Yes**. Now both the ICMP and ARP envelopes are present again. The **Reset Network** button will clear any configuration changes not saved and will clear all dynamic table entries, such as the ARP and MAC table entries.

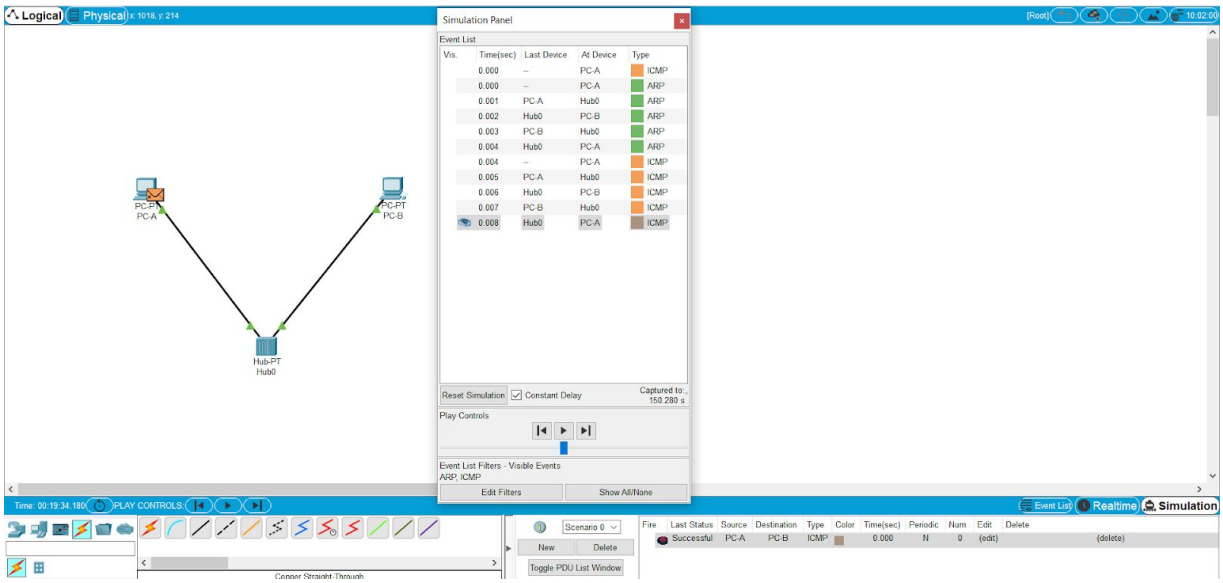
Outcome :



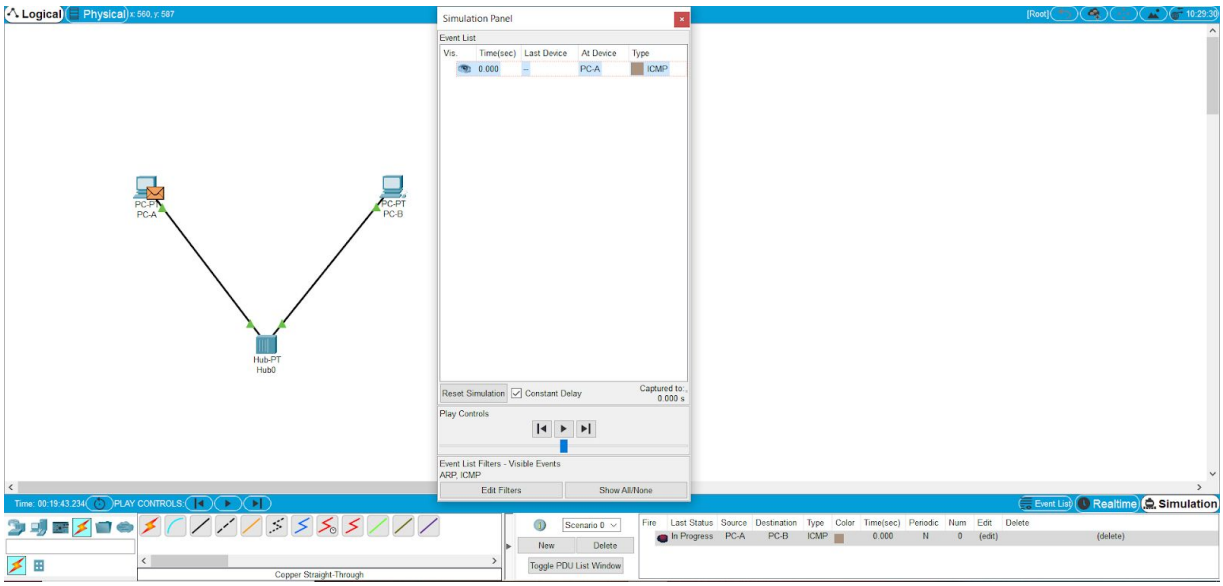
The simulation panel is shown beside the Ethernet network. It shows all the event list filters that are available with the packet tracer and also provides some basic simulation settings like editing filters and resetting the simulation and to play the simulation in a customized manner.



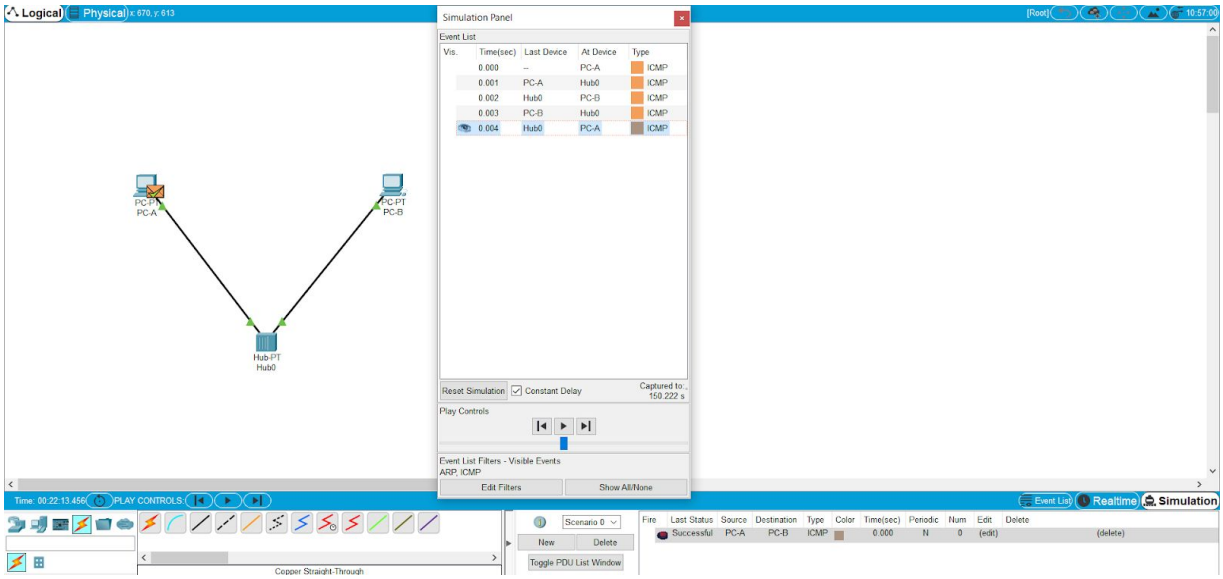
The image shows that only the ICMP and ARP (Address Resolution Protocol) filters are going to be used for the simulation and also the packets are shown besides PC-A (with different colors) since a PDU (Protocol Data Unit) is established with PC-A as the source and PC-B as the destination.



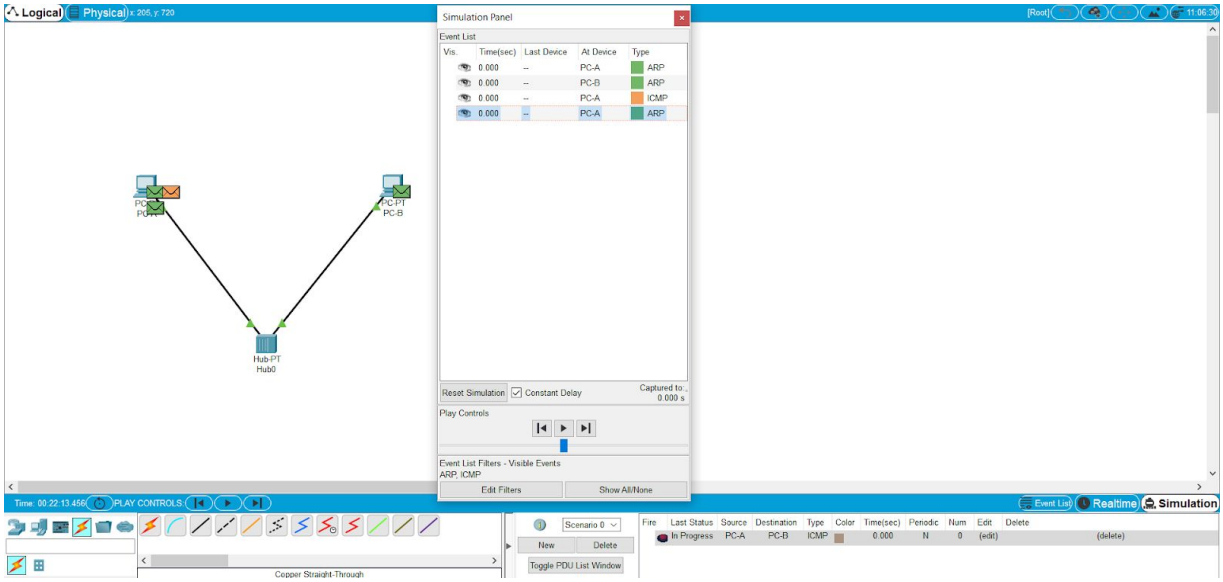
The image shows the steps of the completed simulation and also explains how the ICMP and ARP data packets are transferred between the hub and the personal computers.



The image depicts the scenario after resetting the simulation. The ARP filter is set to visible but the ARP packet is not visible since both the PCs have their MAC addresses stored in the ARP tables.



The image shows the scenario after the simulation of transfer of the ICMP packets. Both the ARP and the ICMP packets follow the path from PC-A to PC-B via the hub and then back to PC-A from PC-B via the hub to complete the communication.



After clicking the **Power Cycle Devices** button, all the dynamic cached entries are cleared and the ARP packets are visible again as shown in the image above. The ARP frames at PC-A are classified as GRATUITOUS and BROADCAST frames. The frame at PC-B is a GRATUITOUS frame similar to that of PC-A. A Gratuitous ARP frame is used to fix the LAN hosts' ARP cache due to a duplicate IP address conflict. However, a Broadcast frame is sent to a common connection point (hub, in this case) to update the IP and MAC entries for the source on every other device connected to the same network. The ICMP frame is sent after the ARP frames to ensure that only the device with the expected IP address returns the packet back to the source.

Step 4: View ARP Tables on each PC

a) Choose the **Auto Capture / Play** button to repopulate the ARP table on the PCs. Click **OK** when the *No More Events* message appears.

b) Select the magnifying glass on the right vertical toolbar.

c) Click **PC-A**. The ARP table for PC-A will appear. Notice that PC-A does have an ARP entry for PC-B. View the ARP table for PC-B as well. Close all ARP table windows.

d) Click the **Select Tool** on the right vertical toolbar. (This is the first icon present in the toolbar.)

e) Click **PC-A** and select the **Desktop** tab.

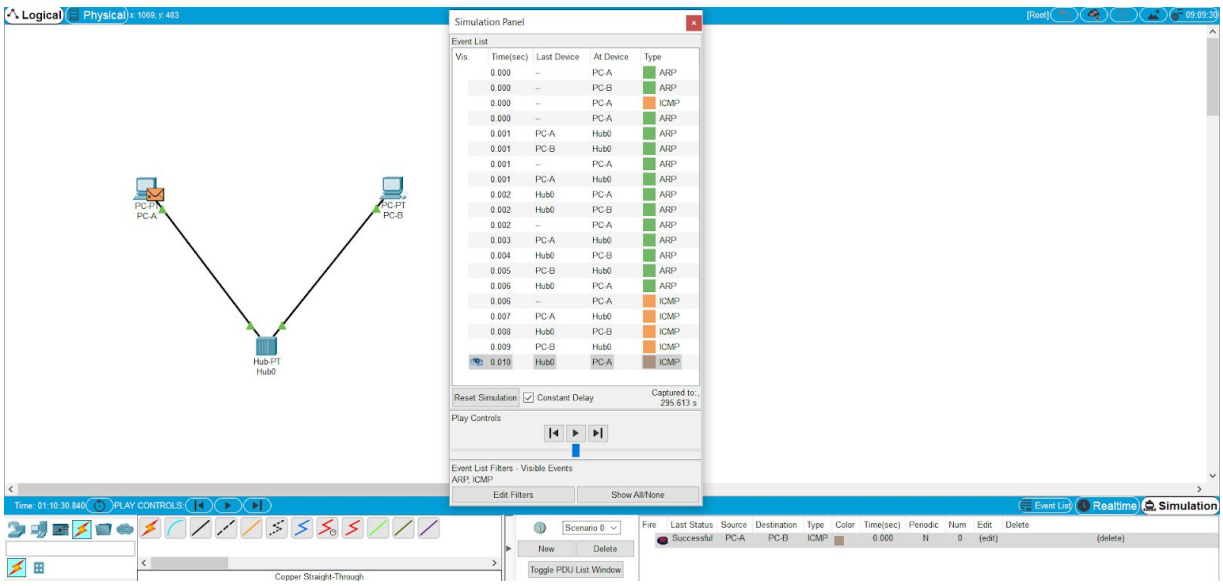
f) Select the **Command Prompt** and type the command **arp -a** and press *enter* to view the ARP table from the desktop view. Close the PC-A configuration window.

g) Examine the ARP table for **PC-B**.

h) Close the PC-B configuration window.

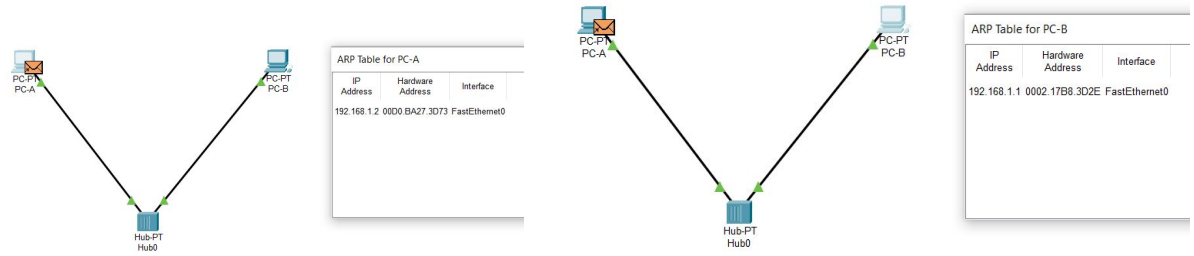
i) Click the **Check Results** button at the bottom of the instruction window to verify that the topology is correct.

Outcome :

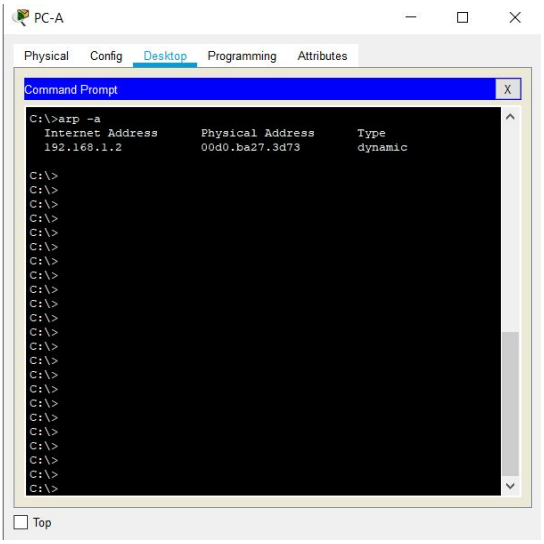


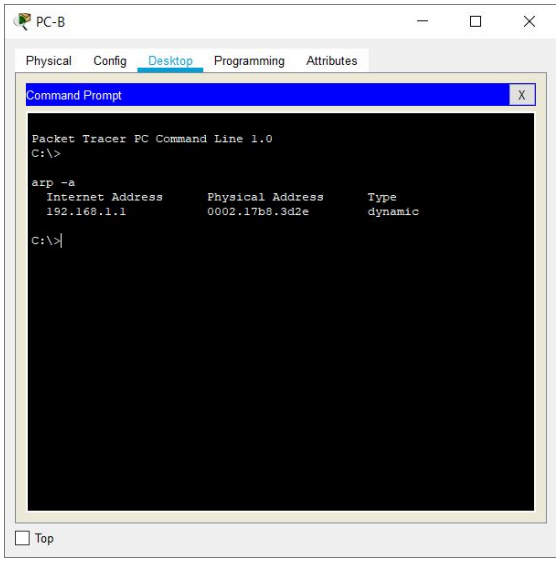
The above image shows the simulation for the repopulation of the ARP table entries. It shows the transfer of two ARP events and one ICMP event through PC-A and PC-B via the hub. The PDU contains one ICMP frame and two ARP frames at PC-A and one ARP frame at PC-B at the start of the simulation. Firstly, each one of PC-A and PC-B sends an ARP frame to the hub but due to the collision at the hub, the frames are dropped by the respective personal computers. Then PC-A sends another ARP frame from the buffer and this

frame reaches PC-B via the hub and then back to PC-A via the hub completing the ARP frame transfer. Now, the ICMP frame is sent by PC-A from the buffer which follows the same way as that of the previous ARP frame and the simulation is completed.



The above images show the cached arp table entries in a Graphical User Interface for PC-A and PC-B.





The above images show the Command Line Interface of the dynamic cached storage of PC-A which shows the IP and MAC (Physical) addresses of PC-B and that of PC-B which has the IP and MAC addresses of PC-A cached in its ARP table. After the completion of the activity, the **Check Results** button shows a success message as shown above.

Deliverables:

Submit model schematic view along proper notations and the outcome of all steps you followed for this experiment, with proper description.