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TE COMPS

Batch A

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Date: 17/08/2020

Data Communication and Computer Networks Lab

Experiment 3

Objectives

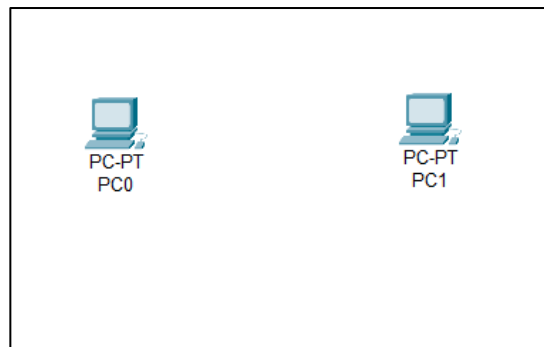
- Install Packet Tracer from <https://www.ciscopods.com/install-packet-tracer-ubuntu/>
- Develop an understanding of the basic functions of Packet Tracer.
- Create/model a simple Ethernet network using two hosts and a hub.
- Observe traffic behavior on the network.
- Observer data flow of ARP broadcasts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

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

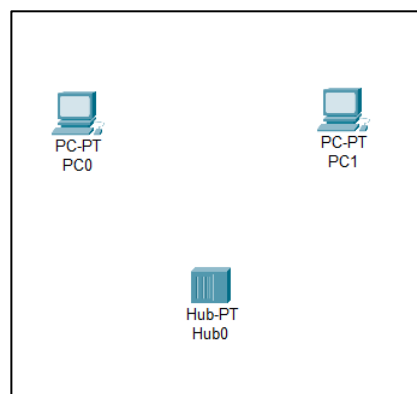
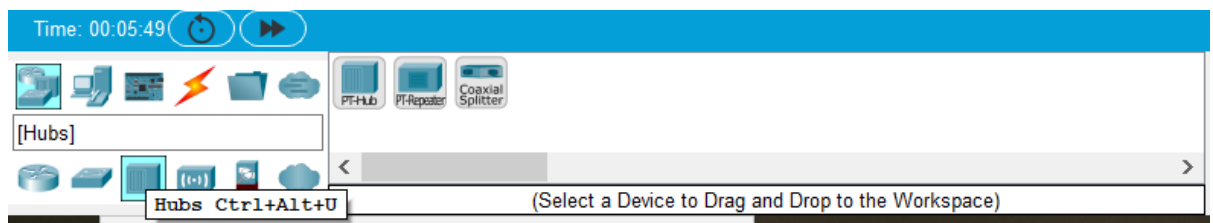
The bottom left-hand corner of the Packet Tracer screen displays eight icons that represent device categories or groups, such as Routers, Switches, or End Devices.

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.

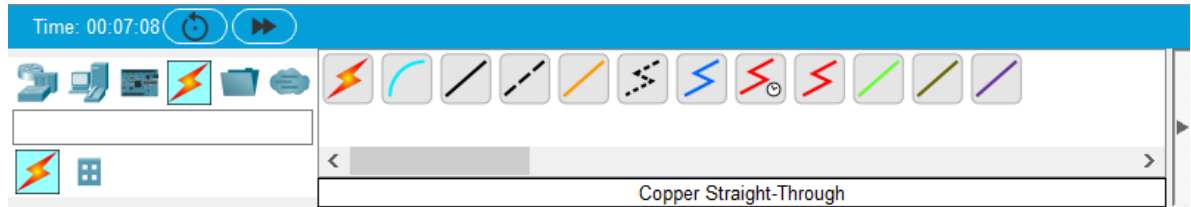


- b) Select **Hubs** from the options in the bottom left-hand corner. Add a hub to the prototype network by dragging and dropping a generic hub onto the design area.



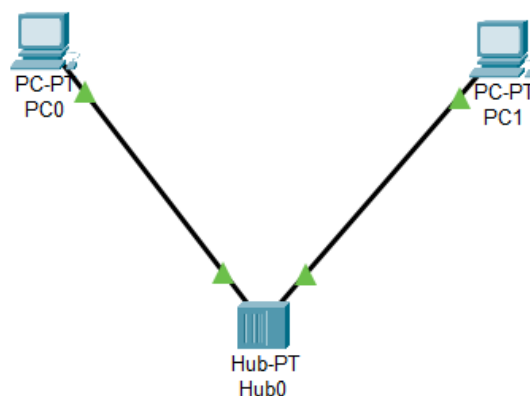
Hub- a "dumb" network packet repeater, only broadcasts what is sent to it. Does not use an ARP table and can't direct traffic like a switch.

- 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**.



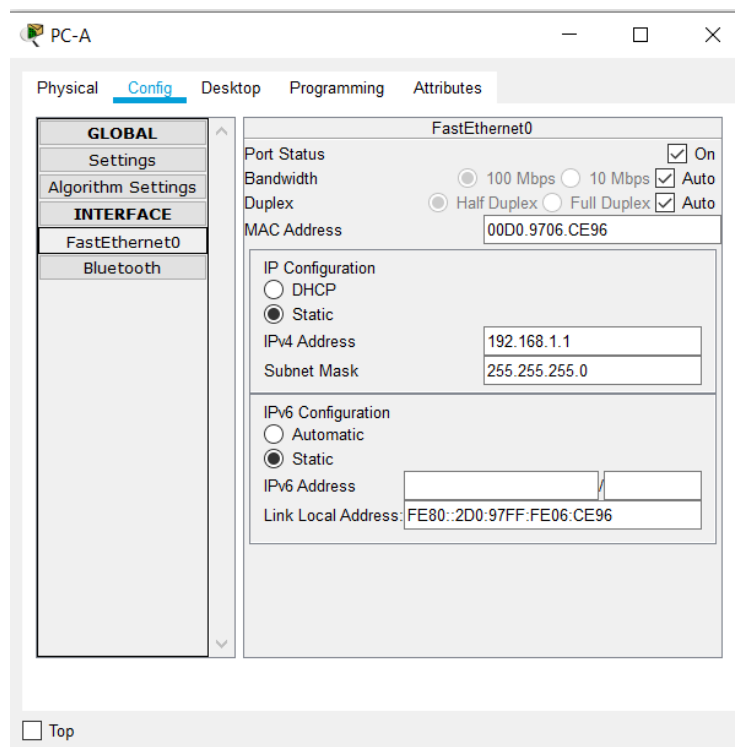
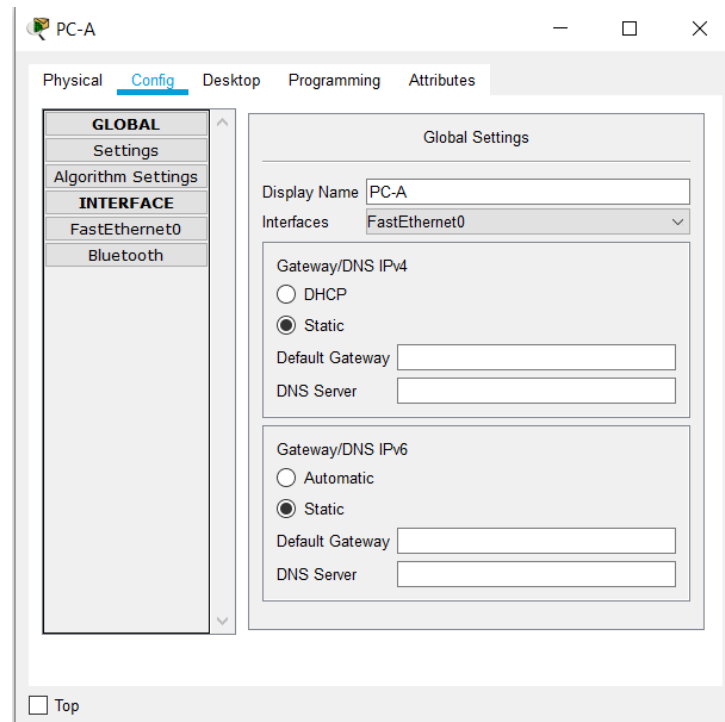
- d) Repeat Step c for the second PC, **PC1**, to connect the PC to **Port 1** on the hub.

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



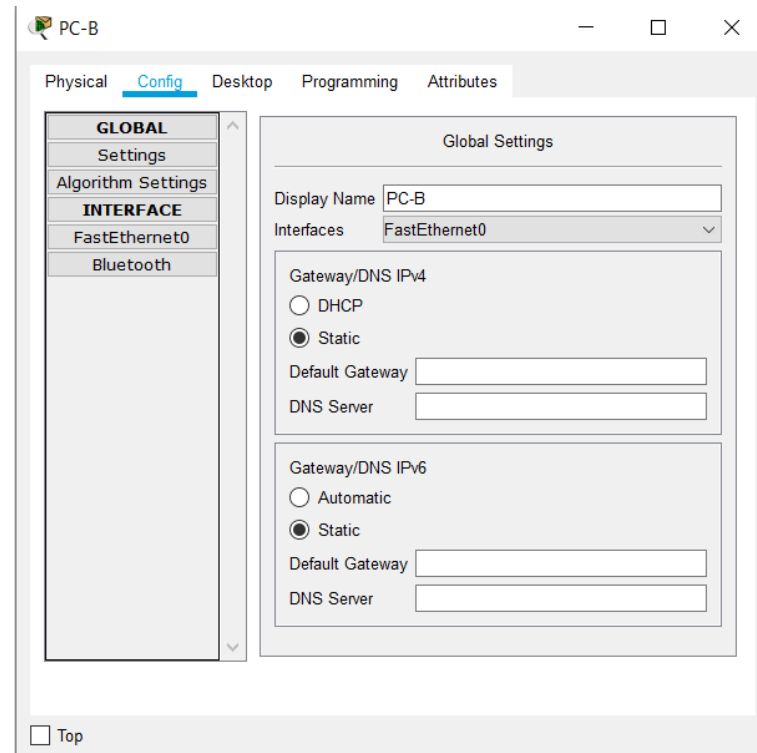
Step 2: Configure host names and IP addresses on the PCs

- 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

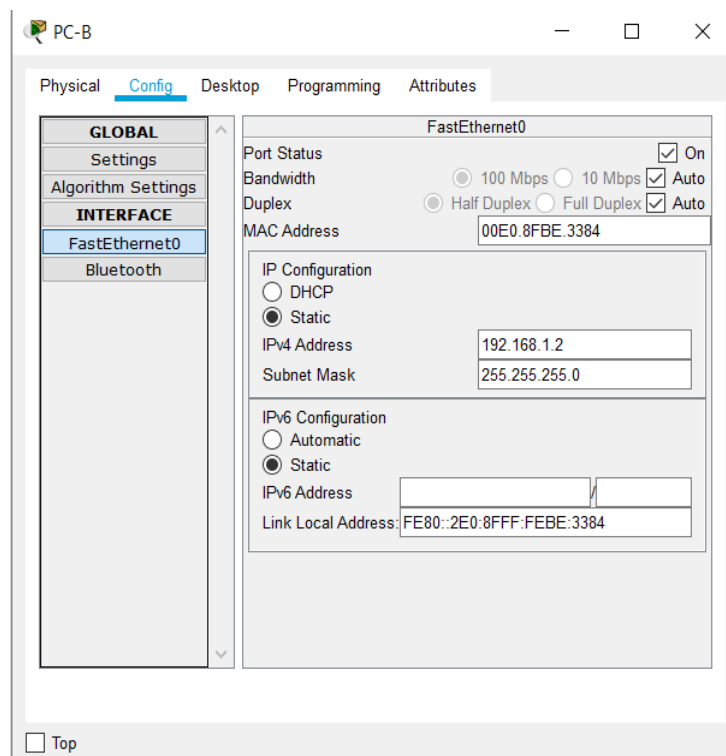
of **192.168.1.2** and subnet mask of **255.255.255.0**. Close the PC-B configuration window.



The image shows the 'Global Settings' tab of the PC-B configuration window. The left sidebar has a tree view with 'GLOBAL' expanded, showing 'Settings', 'Algorithm Settings', and 'INTERFACE'. Under 'INTERFACE', 'FastEthernet0' is selected. The main area is titled 'Global Settings' and contains the following fields:

- Display Name: PC-B
- Interfaces: FastEthernet0 (dropdown)
- Gateway/DNS IPv4:
 - ☐ DHCP
 - ☒ Static
 - Default Gateway: [empty]
 - DNS Server: [empty]
- Gateway/DNS IPv6:
 - ☐ Automatic
 - ☒ Static
 - Default Gateway: [empty]
 - DNS Server: [empty]

At the bottom left, there is a 'Top' button.



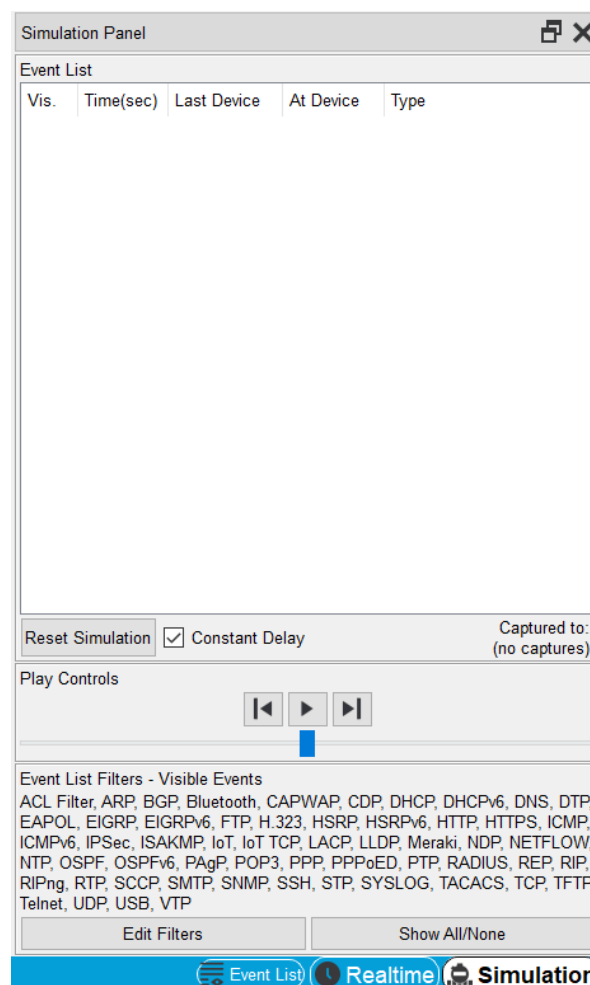
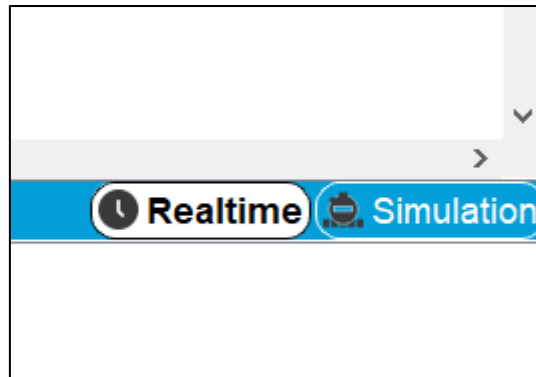
The image shows the 'FastEthernet0' interface configuration tab of the PC-B configuration window. The left sidebar is the same as the previous image, but 'FastEthernet0' is selected under the 'INTERFACE' section. The main area is titled 'FastEthernet0' and contains the following fields:

- Port Status: ☒ On
- Bandwidth: ☒ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex: ☒ Half Duplex ☐ Full Duplex ☒ Auto
- MAC Address: 00E0.8FBE.3384
- IP Configuration:
 - ☐ DHCP
 - ☒ Static
 - IPv4 Address: 192.168.1.2
 - Subnet Mask: 255.255.255.0
- IPv6 Configuration:
 - ☐ Automatic
 - ☒ Static
 - IPv6 Address: [empty]
 - Link Local Address: FE80::2E0:8FFF:FE80:3384

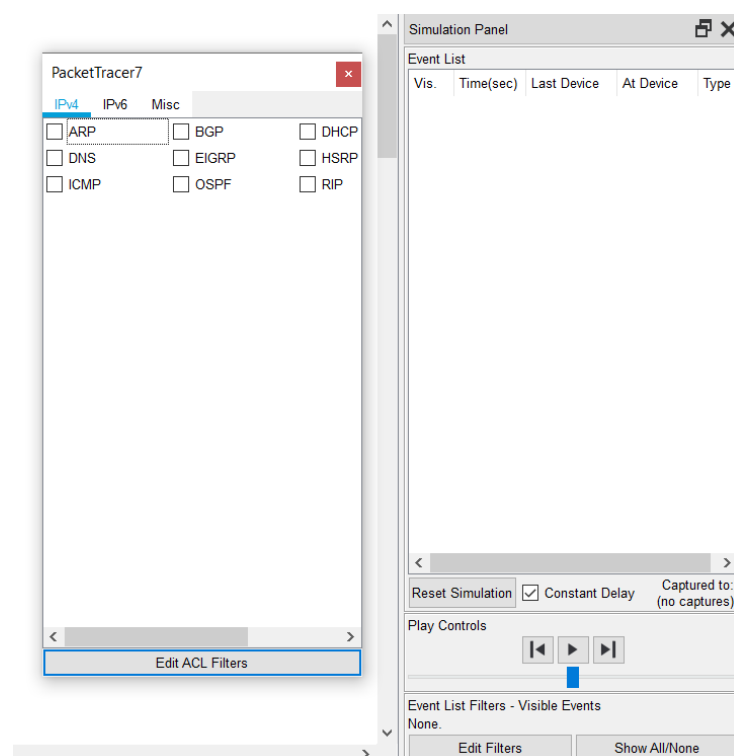
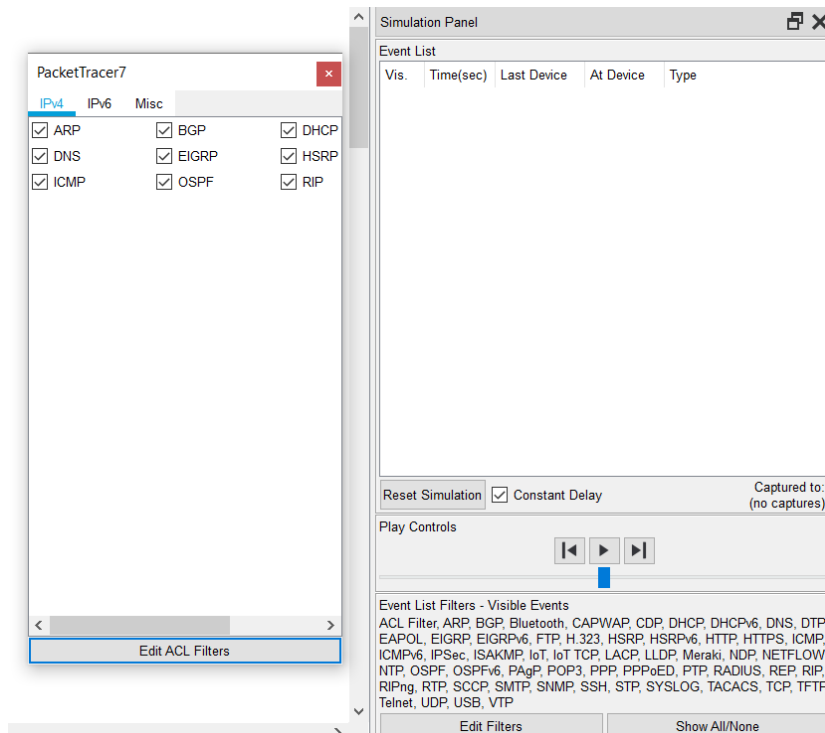
At the bottom left, there is a 'Top' button.

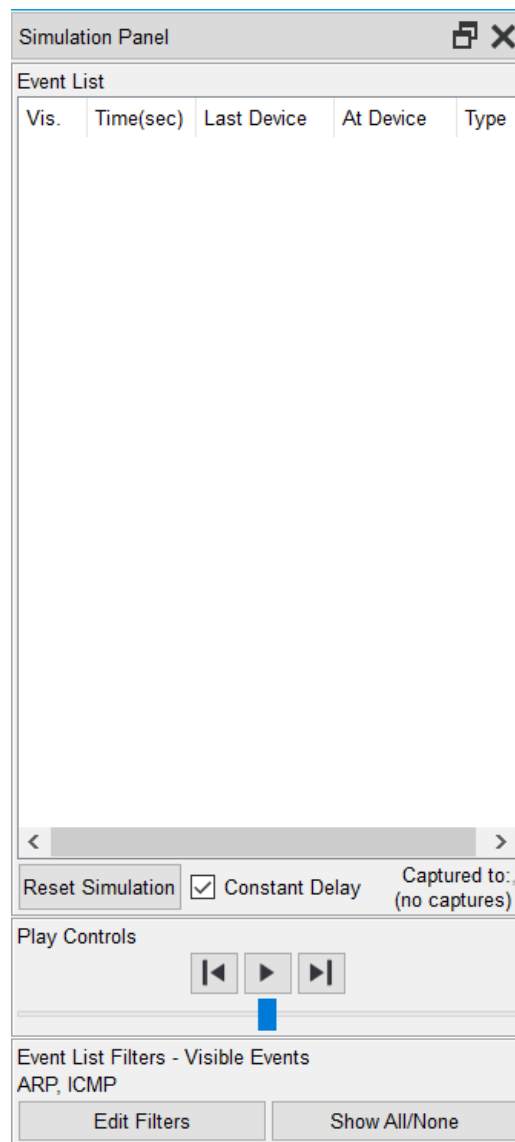
Step 3: Observe the flow of data from PC-A to PC-B by creating network traffic

- 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.





ARP – Address Resolution Protocol

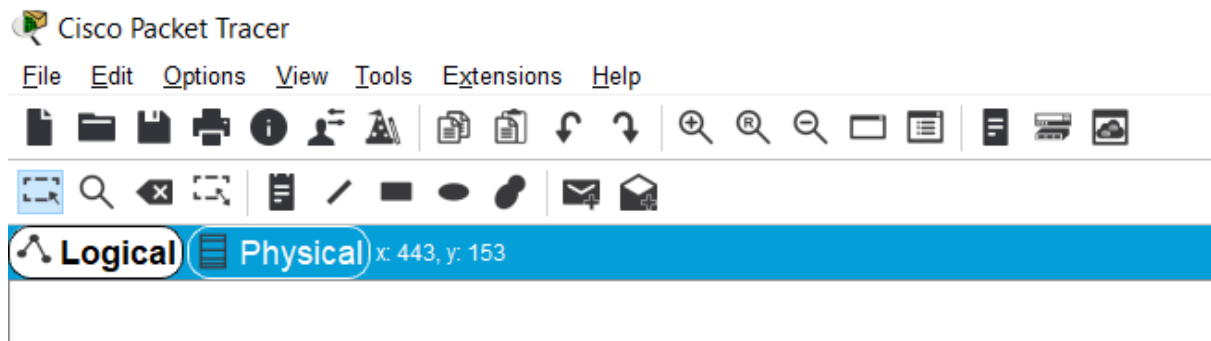
Used by PC to declare itself on the network, and discover the other PCs on the network. Contains MAC and IP address.

ICMP – Internet Control Message Protocol

A utility format used by Ping command and others to determine connectivity over networks.

If you filter out some type of PDUs on the Event List Filters, they will not show up on the Event List. They are still in the network; you just do not see them. The simulation runs more quickly because you will not see the filtered events, but all filtered PDUs still affect the network.

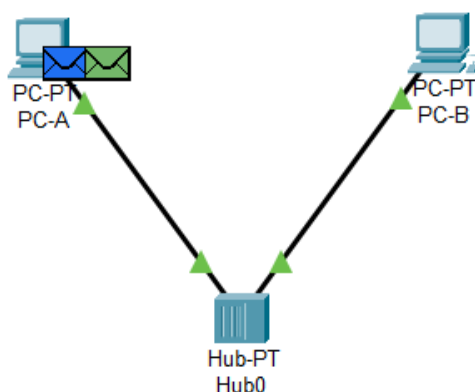
- c) Select a **Simple PDU** by clicking the closed envelope on the right vertical toolbar. Move your cursor to the display area of your screen. Click **PC-A** to establish the source. Move your cursor to **PC-B** and click to establish the destination.



PDU – Protocol Data Unit

- In telecommunications, a protocol data unit is a single unit of information transmitted among peer entities of a computer network.
- A PDU is composed of protocol-specific control information and user data.

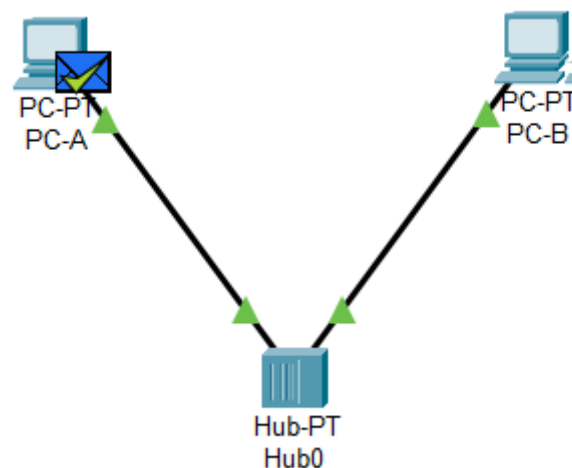
****Notice that two envelopes are now positioned beside PC-A. One envelope is ICMP, while the other is ARP. The Event List in the Simulation Panel will identify exactly which envelope represents ICMP and which represents ARP.**



Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC-A	ICMP
	0.000	--	PC-A	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

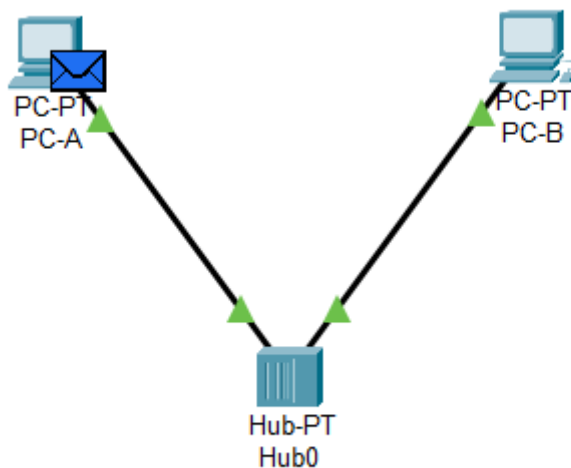
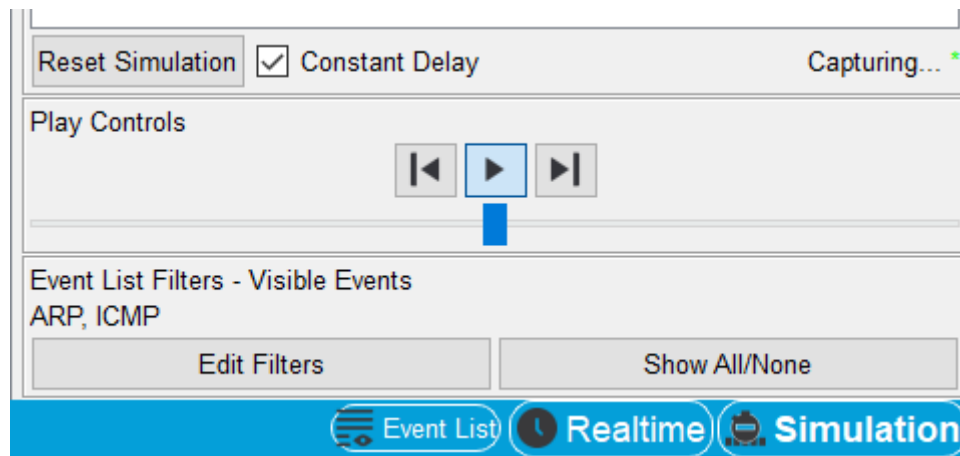
the simulation. Dragging the button to the right will speed up the simulation, while dragging is to the left will slow down the simulation.



Simulation Panel				
Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC-A	ICMP
	0.000	--	PC-A	ARP
	0.001	PC-A	Hub0	ARP
	0.002	Hub0	PC-B	ARP
	0.003	PC-B	Hub0	ARP
	0.004	Hub0	PC-A	ARP
	0.004	--	PC-A	ICMP
	0.005	PC-A	Hub0	ICMP
	0.006	Hub0	PC-B	ICMP
	0.007	PC-B	Hub0	ICMP
	0.008	Hub0	PC-A	ICMP

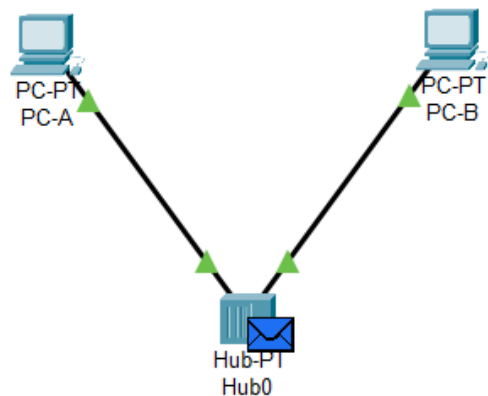
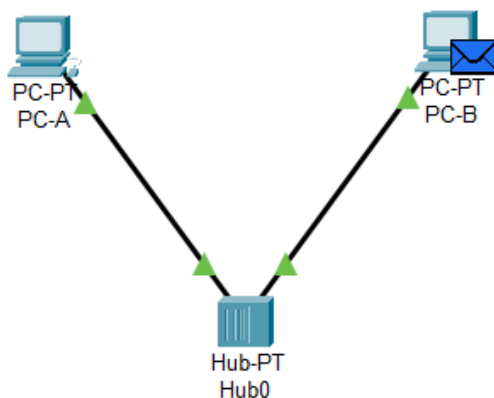
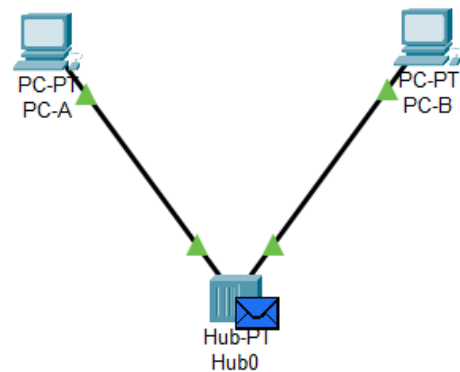
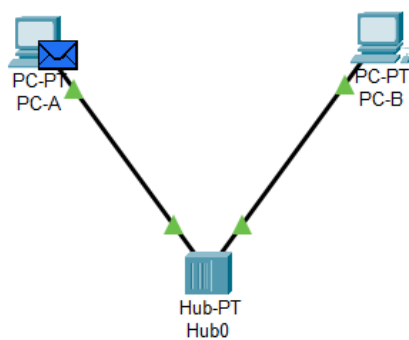
The ARP is sent first, to discover the IP address of each PC. The ARP tables will populate first, otherwise PCs can't ping each other. ICMP is used to ping each PC.

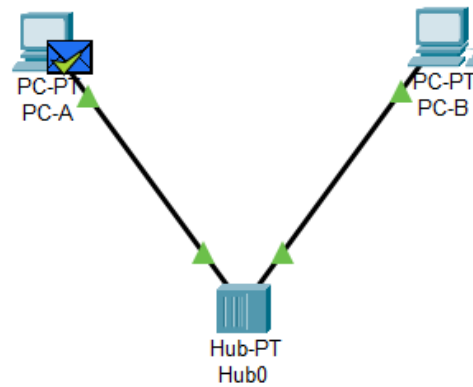
- e) The animation will run until the message window *No More Events* appears. All requested events have been completed. Select OK to close the message box.
- f) Choose the **Reset Simulation** button in the Simulation Panel. Notice that the ARP envelope is no longer present. This has reset the simulation 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.



Simulation Panel				
Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC-A	ICMP

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.



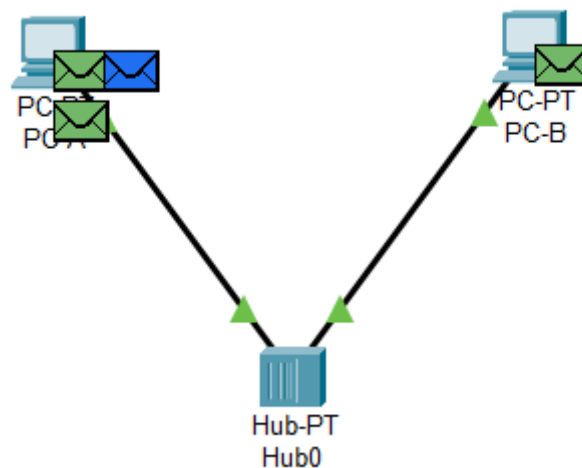
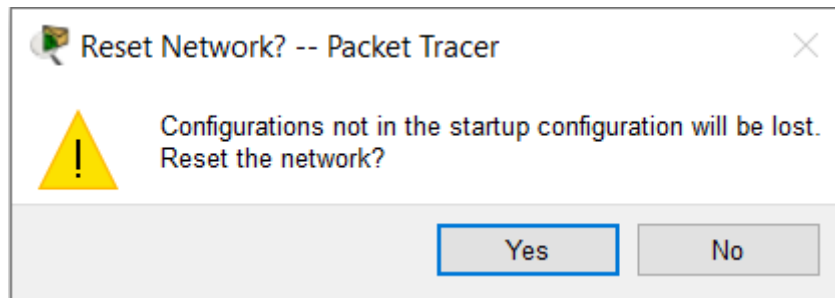


Simulation Panel				
Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC-A	ICMP
	0.001	PC-A	Hub0	ICMP
	0.002	Hub0	PC-B	ICMP
	0.003	PC-B	Hub0	ICMP
	0.004	Hub0	PC-A	ICMP

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

This option turns all devices on network off and then on. By doing so, they lose temporary information like the tables they learned.

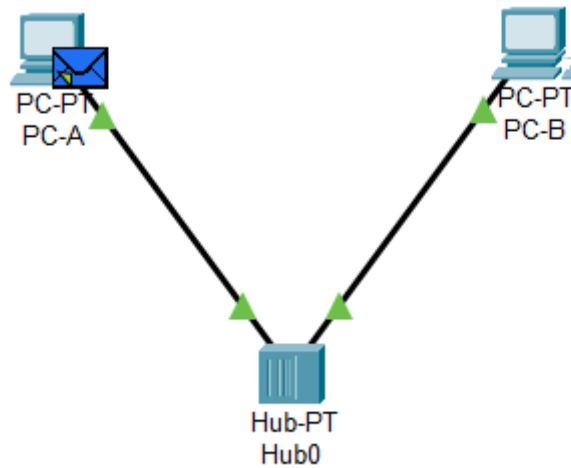
- i) An error message will appear asking you to confirm reset. Choose **Yes**. Now both the ICMP and ARP envelopes are present again. The **Reset Network** button will clear any configuration changes not saved and will clear all dynamic table entries, such as the ARP and MAC table entries.



Simulation Panel				
Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC-A	ARP
	0.000	--	PC-B	ARP
	0.000	--	PC-A	ICMP
	0.000	--	PC-A	ARP

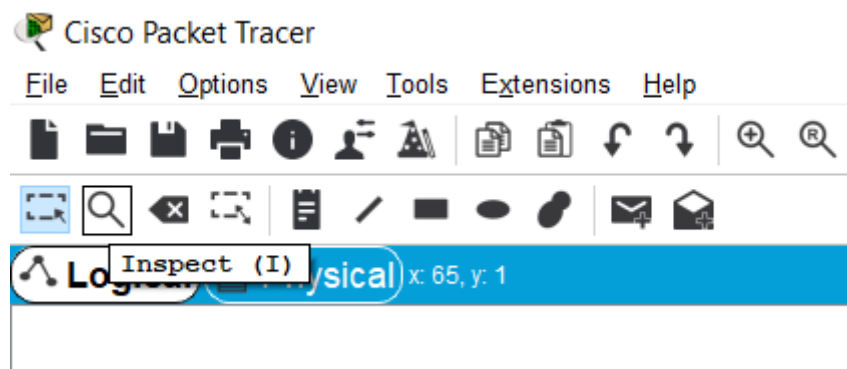
Step 4: View ARP Tables on each PC

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



Simulation Panel				
Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC-B	ARP
	0.000	--	PC-A	ICMP
	0.000	--	PC-A	ARP
	0.001	PC-A	Hub0	ARP
	0.001	PC-B	Hub0	ARP
	0.001	--	PC-A	ARP
	0.001	PC-A	Hub0	ARP
	0.002	Hub0	PC-A	ARP
	0.002	Hub0	PC-B	ARP
	0.002	--	PC-A	ARP
	0.003	PC-A	Hub0	ARP
	0.004	Hub0	PC-B	ARP
	0.005	PC-B	Hub0	ARP
	0.006	Hub0	PC-A	ARP
	0.006	--	PC-A	ICMP
	0.007	PC-A	Hub0	ICMP
	0.008	Hub0	PC-B	ICMP
	0.009	PC-B	Hub0	ICMP
	0.010	Hub0	PC-A	ICMP

b) Select the magnifying glass on the right vertical tool bar.

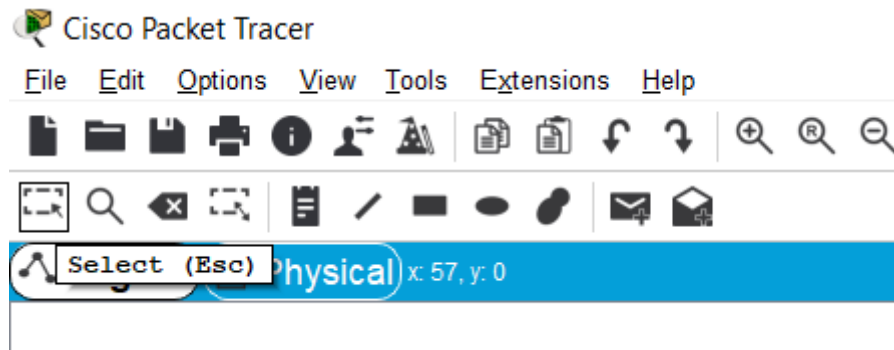


c) Click **PC-A**. The ARP table for PC-A will appear. Notice that PC-A does have an ARP entry for PC-C. View the ARP tables for PC-B and PC-C as well. Close all ARP table windows.

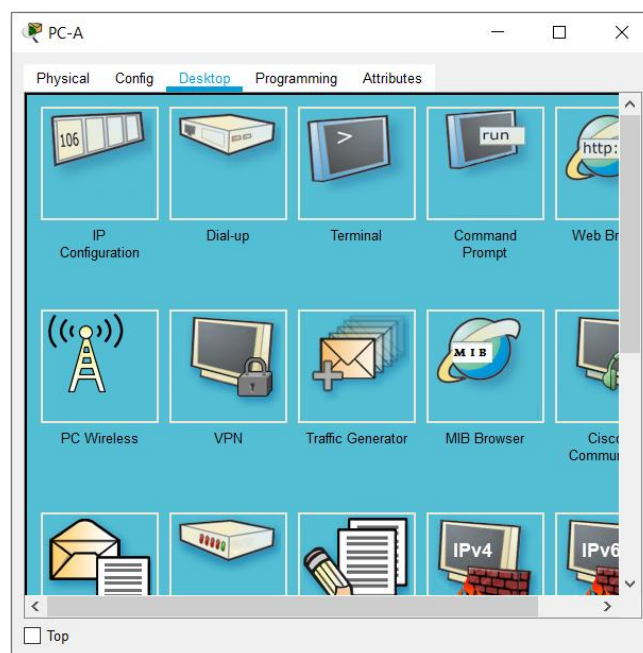
ARP Table for PC-A			
IP Address	Hardware Address	Interface	
192.168.1.2	000B.BE0B.0707	FastEthernet0	

ARP Table for PC-B			
IP Address	Hardware Address	Interface	
192.168.1.1	0005.5E77.5296	FastEthernet0	

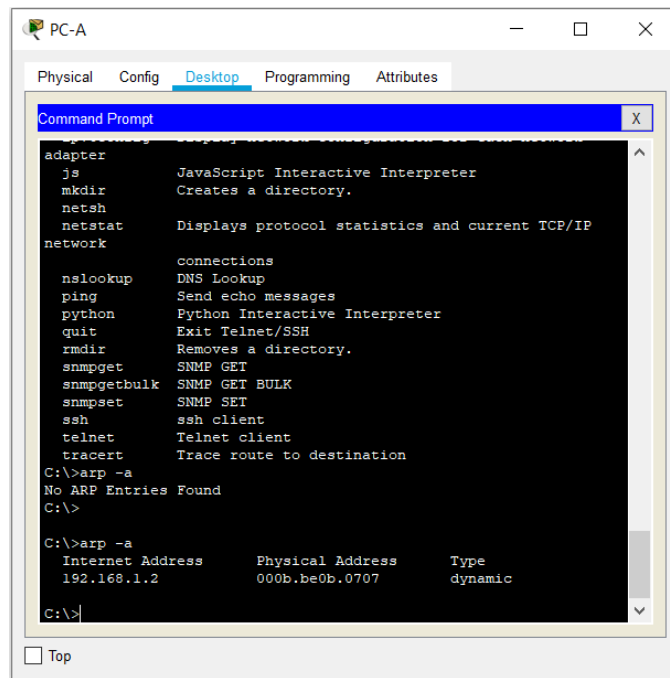
- d) Click the **Select Tool** on the right vertical tool bar. (This is the first icon present in the toolbar.)



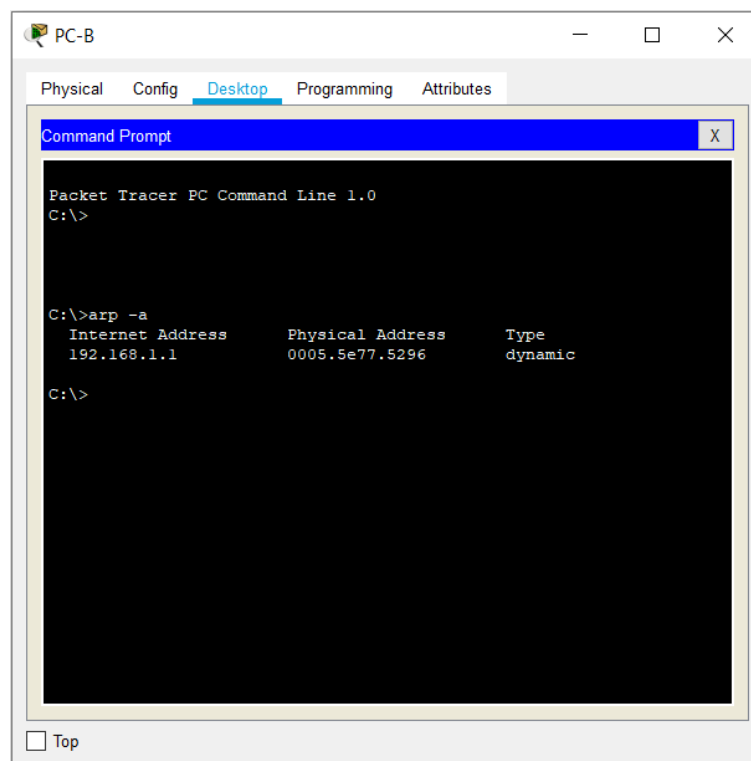
- e) Click **PC-A** and select the **Desktop** tab.



- 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.

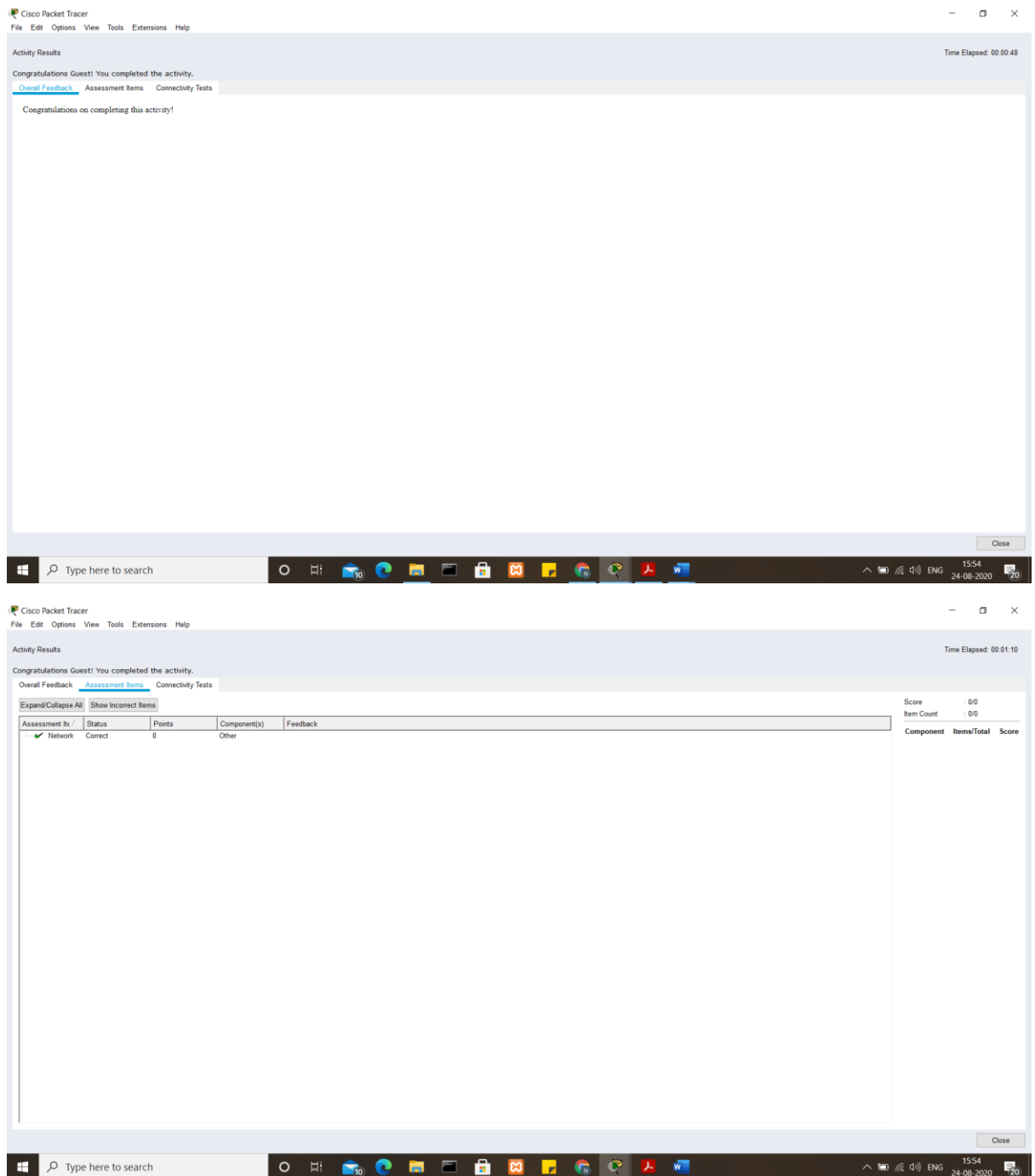


g) Examine the ARP table for **PC-B**.



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.



Conclusion:

1. In this experiment, I learned about how packet travels in a simple ethernet network.
2. I implemented this network on packet tracer tool.
3. I understood the concept of ARP and ICMP protocol.