Lab 03: IP Addressing basics & Packet Tracer

Part A

Objectives:
This lab gives a basic understanding of the address used in pc mainly MAC, IP and PORT
This will enable students to differentiate between different classes of address

Tutorial

MAC Address:

Media Access Control address is a hardware address, usually 48 bits, which is used to uniquely identify each node of a network. They are also called Data Link addresses. MAC addresses are expressed in hexadecimal notation in the following format: 01-23-45-67-89-AB, in the case of a 48-bit address. Colons (:) are sometimes used instead of dashes (-).

Run **ipconfig/all** from a Command Prompt window.

(Click **Start**, then **Run**, then type "cmd" in the text box)

type in **ipconfig/all** in the Command Prompt Windows.

The 12-digit "Physical Address" is the same as MAC address

IP Address:

IP address is the address of a computer interface on the network. A computer may have several IP addresses if it has more than one interface. For example, a computer with two NICs will have two IP addresses.
IP addresses fall into one of the five classes. This classification depends on the leading bits in an address. Possible classes are:

Class	Leading bits	Range
A	0	1.0.0.0–127.255.255.255
B	10	128.0.0.0–191.255.255.255
C	110	192.0.0.0–223.255.255.255

D	1110	224.0.0.0–239.255.255.255
E	1111	240.0.0.0–255.255.255.255

Generally, you will rarely see class D or E addresses.

IP addresses can also be divided into two groups: Private addresses or Globally unique addresses. Non-Routable or Private Addresses fall in the range as under:

10.0.0.0–10.255.255.255

172.16.0.0–172.31.255.255

169.254.0.0–169.254.255.255 (auto configure IP addresses)

192.168.0.0–192.168.255.255

All other class A, class B and class C addresses are legal.

Routers do not forward packets from non-routable/private IP addresses. However, this does not mean that these machines are not able to communicate over the Internet; their addresses must be remapped to global addresses for communication to happen. Routers that support network address translation (NAT) provide a way of doing this.

Network Mask:

Network addresses can be divided into two parts. The higher order bits are used to identify the network and the lower order bits are used to identify the host. If Subnetting is used, the higher order bits will be divided between the network number and the subnet number.
Non-zero bits in the network mask are used to determine the address bits that are used for the network portion of the address. The remaining bits are number of hosts in the network. For example, a network mask of 255.255.255.0 uses the first 24 bits to determine the network and the last eight bits as the host number. The class of the address determines the default network mask.

Broadcast Address:

This address is used to send requests to each and every computer on the local network. It is used by protocols like ARP. Broadcast address is formed by simply setting all the bits in the host portion of the address to ones.

Default Router or Gateway:

If two machines have the same network and subnet numbers, they are on the same subnet and can communicate directly. If this is not the case, packets must be routed for one subnet to another. A host may know which router to send the packet to for a specific host. If this is not the case, then the packet is sent to a default router that must forward the packet onto the next network on the path to its destination.

Part B

Cisco Packet Tracer: A Network Simulation Tool

About Packet Tracer:

Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface. Packet Tracer makes use of a drag and drop user interface, allowing users to add and remove simulated network devices as they see fit. The software is mainly focused towards Cisco Network Associate Academy students as an educational tool for helping them learn fundamental Networking concepts.

You all are suggested to Download and Install Cisco Packet Tracer tool on your PCs from the following links (free):

Download Links

Link 1: https://www.filehorse.com/download-cisco-packet-tracer-64/download/

Link 2: https://www.netacad.com/courses/packet-tracer

How to Install Cisco Packet Tracer on Windows System:

https://ipwithease.com/how-to-install-packet-tracer-on-windows-system/

Part C

1. Introduction:

Packet Tracer is a network simulator developed at Cisco Systems. Packet Tracer (PT) is a powerful and dynamic tool that simulates the various protocols used in networking, in either Real Time or Simulation mode. This includes layer 2 protocols such as Ethernet and PPP, layer 3 protocols such as IP, ICMP, and ARP, and layer 4 protocols such as TCP and UDP. Routing protocols can also be traced. Packet Tracer is a supplement to and not a replacement for experience with real equipment. Students are encouraged to compare the results obtained from Packet Tracer network models with the behavior of real equipment.

Packet Tracer is a powerful network simulator that can be utilized in training for Network certifications by allowing students to create networks with an almost unlimited number of devices and to experience troubleshooting without having to buy real Cisco routers or switches. The tool is created by Cisco Systems. The purpose of Packet Tracer is to offer students a tool to learn the principles of networking as well as develop Cisco technology specific skills. However, it is not being used as a replacement for Routers or Switches.

As a network engineer, it is used to simulate complex scenarios first on packet tracer and then deploy them on the real equipment's. Please notice though, the labs will not teach you networking, but rather let teach you how to simulate and apply your networking related knowledge.

2. Tools required:

- CISCO Packet tracer

3. Objective of the Experiment:

After completing this Lab student should able to:

- Installation of Cisco Packet Tracer.
- To have understanding of CISCO Packet Tracer.
- To have knowledge about each and every component used in this software as related to course.
- Basic knowledge to make topologies and further working on this easily.

4. Installating Cisco Packet Tracer 7.0 in Windows 7,8,10 – 32/64 Bit:

Once you have finished downloading the software, it's time to install it. Let us see how to install Cisco Packet Tracer in Windows.

Any installation in Windows is just clicks and mouse and the same applies to **Packet tracer**. Click on the exe file downloaded.

The below screen appears. Select "I accept the agreement" and click on "Next ".

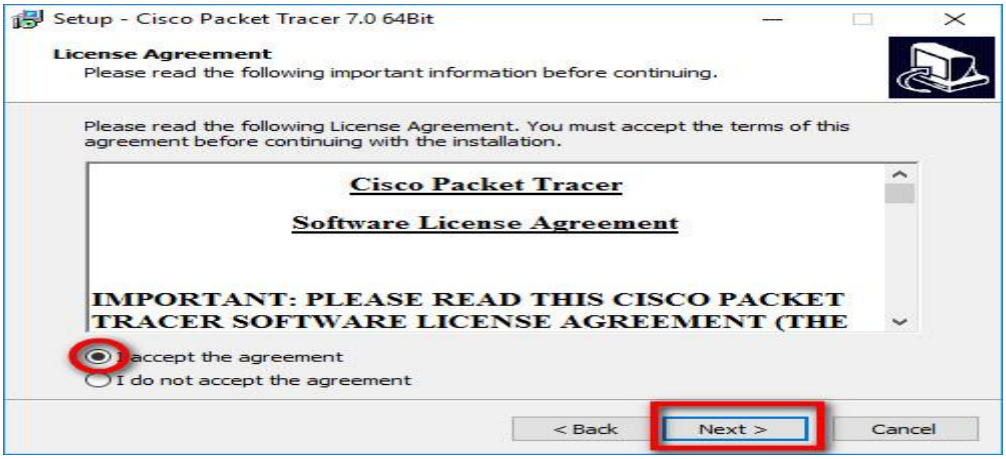

Figure 1: first step of cisco packet tracer

Setup will show the folder in which the program's shortcuts will be created. If you want to change the folder, you can change it. Click on "Next ".

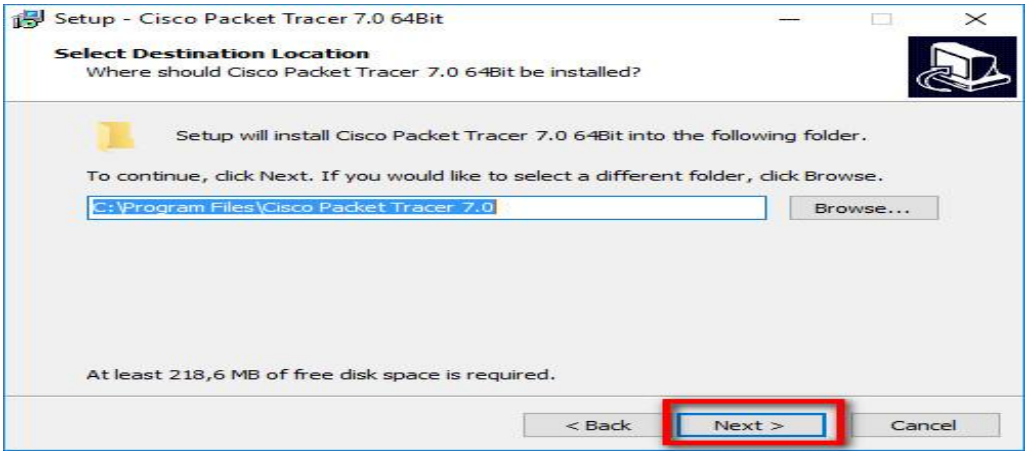

Figure 2: second step of cisco packet tracer

Then the program will ask whether to create a Desktop icon and create a Quick Launch icon. Make your own choice and click on “Next “.

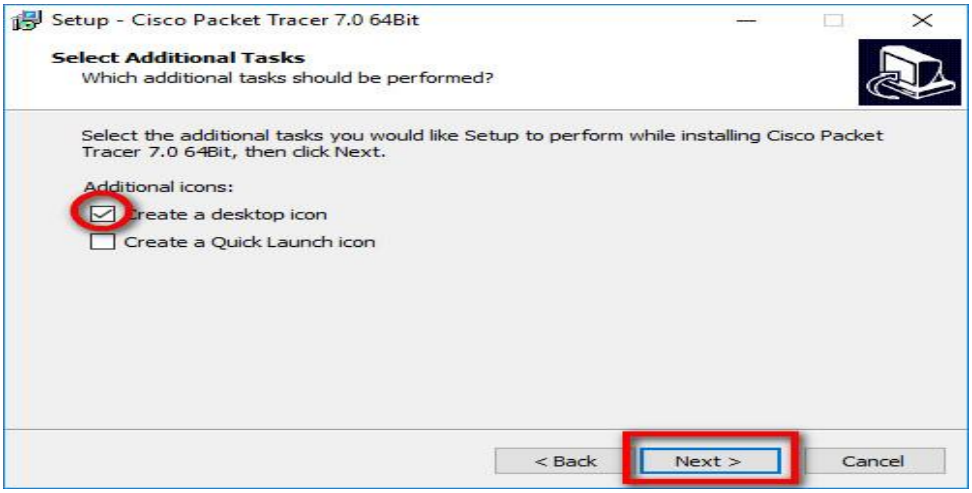

Figure 3: Third step of cisco packet tracer

Then the summary of the settings we selected is displayed. Click on “**Install** “.

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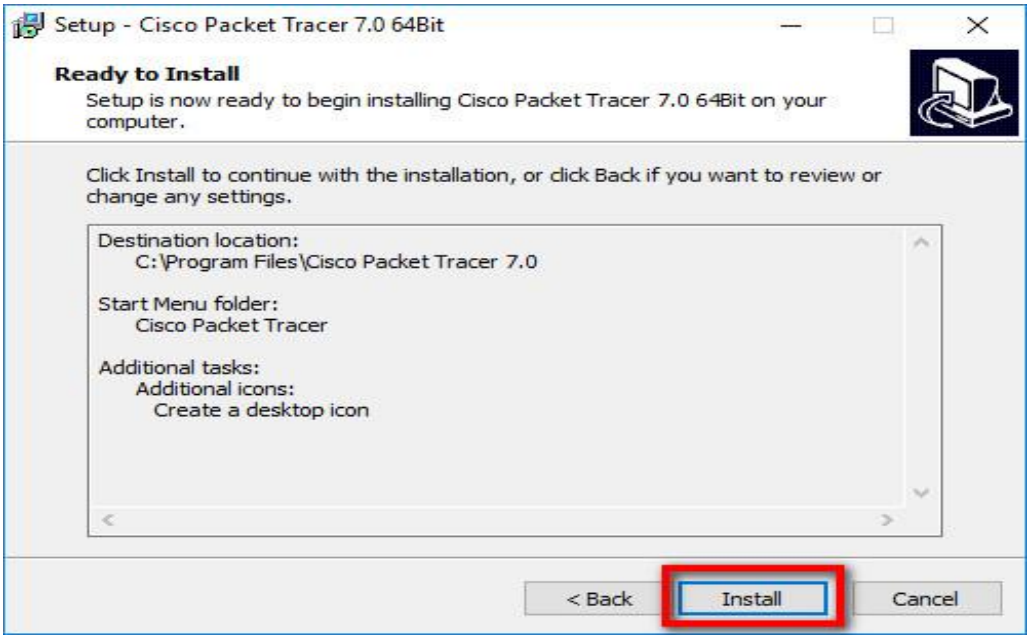


Figure 4: Fourth step of cisco packet tracer

The installation will begin like this:

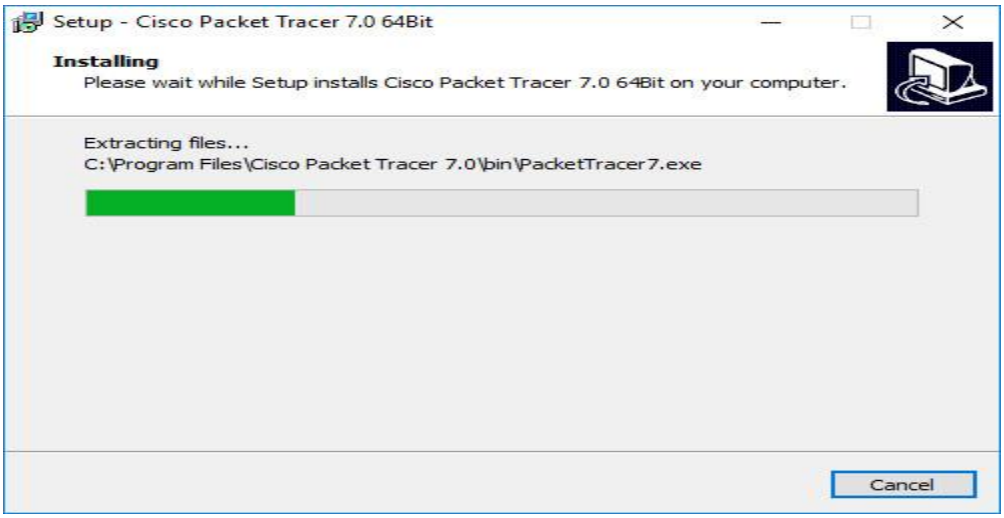


Figure 5:Fifth step of cisco packet tracer

In seconds, installation gets completed and the below screen is shown. Click on "**Finish**".

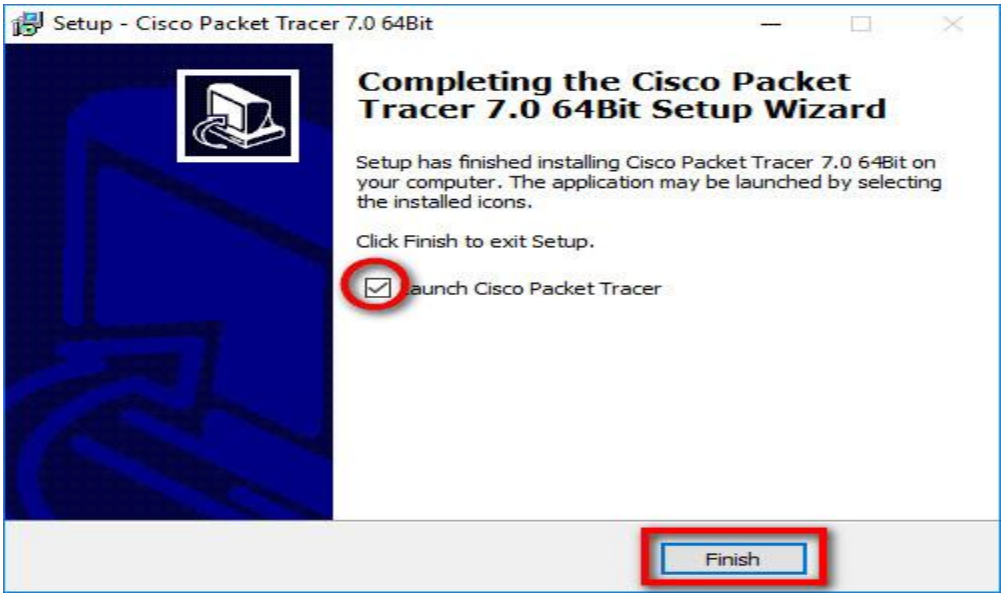


Figure 6: sixth step of cisco packet tracer

Then the below popup appears asking you to close or restart your computer. Click on “OK “.

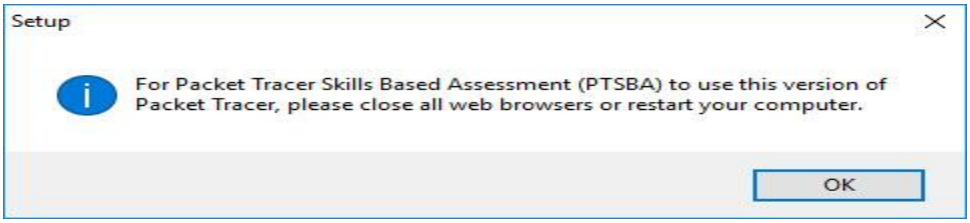


Figure 7: ok notification

As we selected Launch option, Packet tracer is automatically launched. It should look like below.

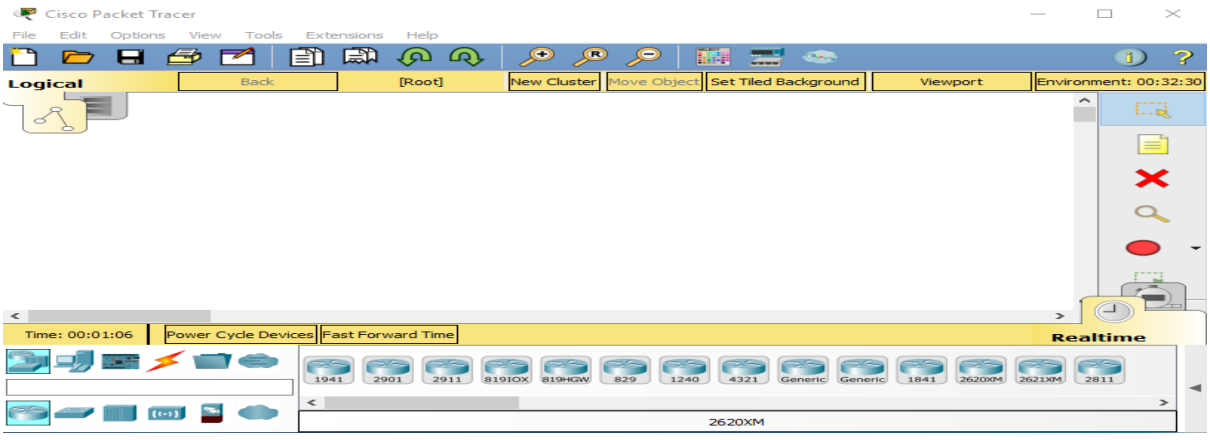


Figure 8: packet tracer Console

5. Walk-through Tasks:

5.1 Creating a New Topology in Packet Tracer:

Start Packet Tracer

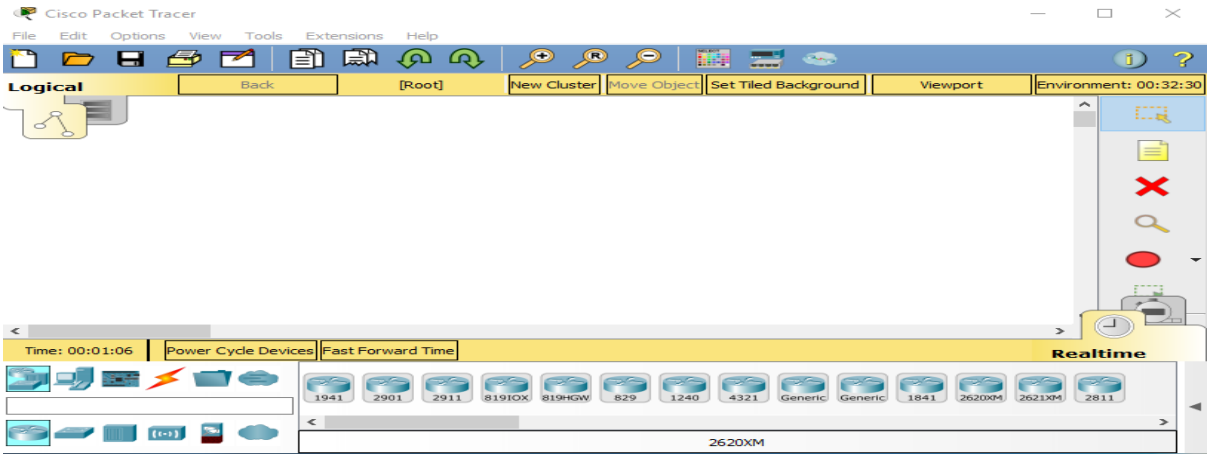


Figure 9: Packet tracer console

5.2 Choosing Devices and Connections

We will begin building our network topology by selecting devices and the media in which to connect them. Several types of devices and network connections can be used. For this lab we will keep it simple by using End Devices, Switches, Hubs, and Connections.

Single click on each group of devices and connections to display the various choices. When we select a device in the left panel, in the right panel we see all the listed devices of that type.

Click on end devices

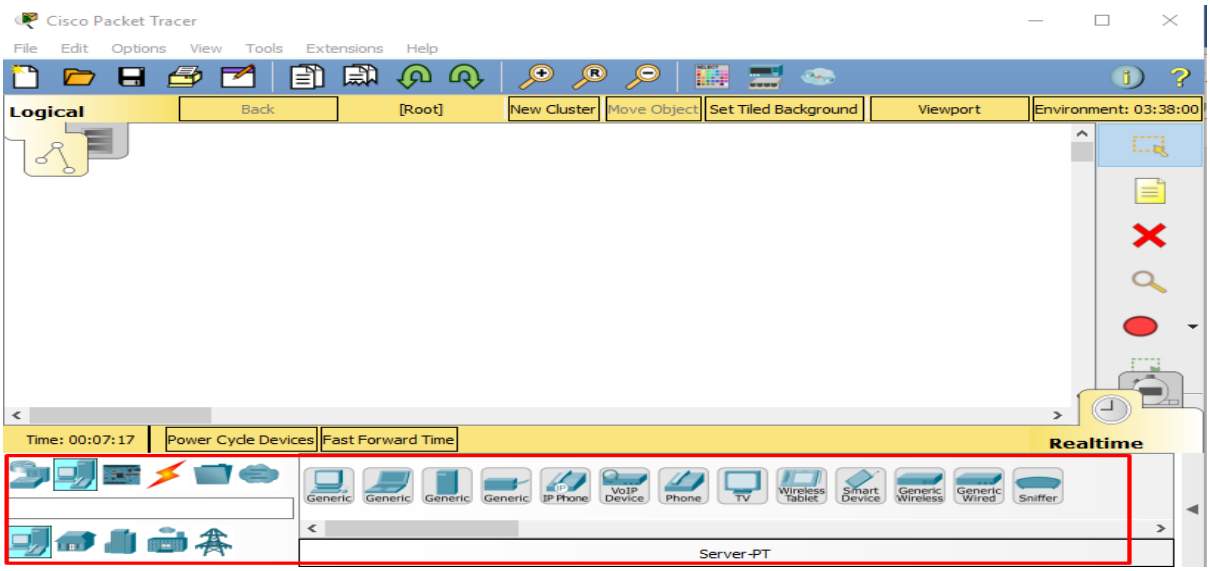


Figure 10: Showing end devices on Packet tracer

Single click on the Generic host.

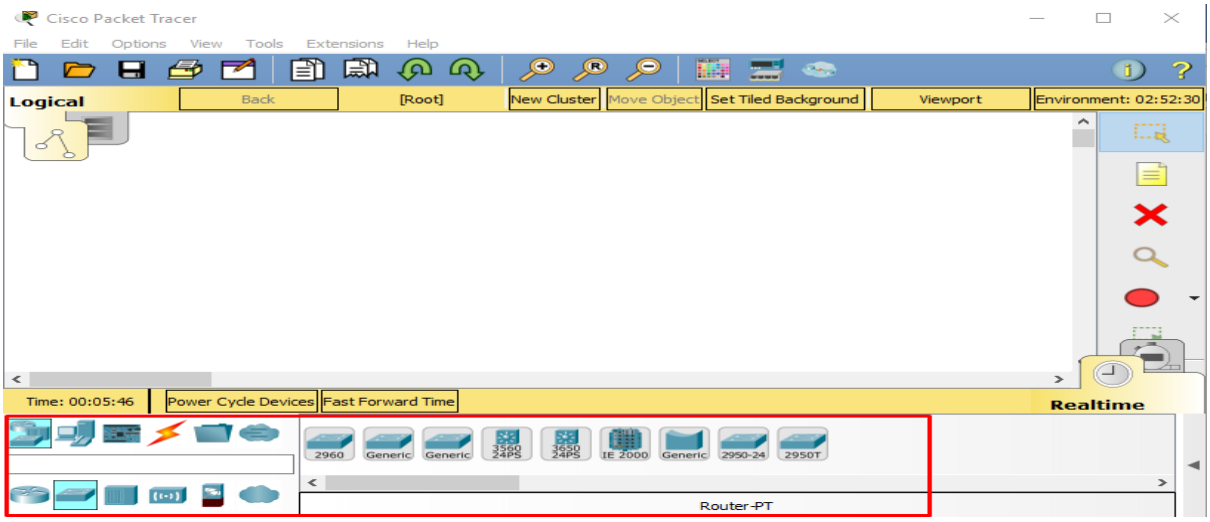


Figure 11: showing generic hosts

Move the cursor into topology area. You will notice it turns into a plus “+” sign.

Single click in the topology area and it copies the device.

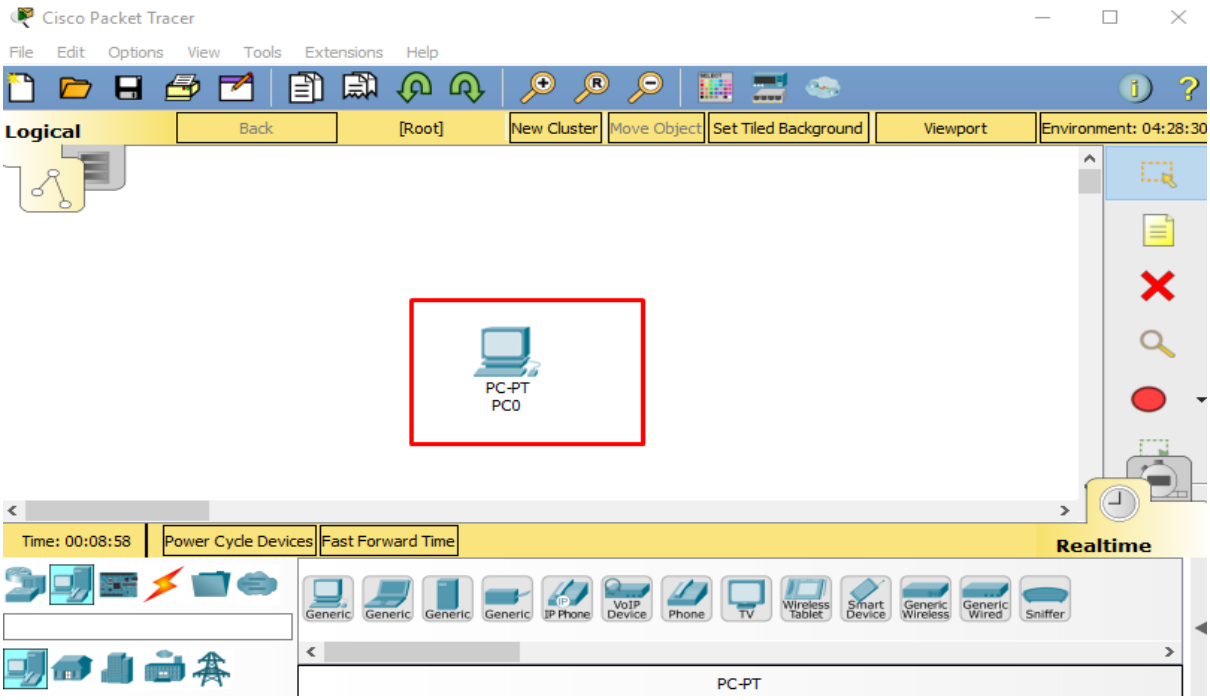


Figure 12: Selection of generic computer

Add three more hosts.

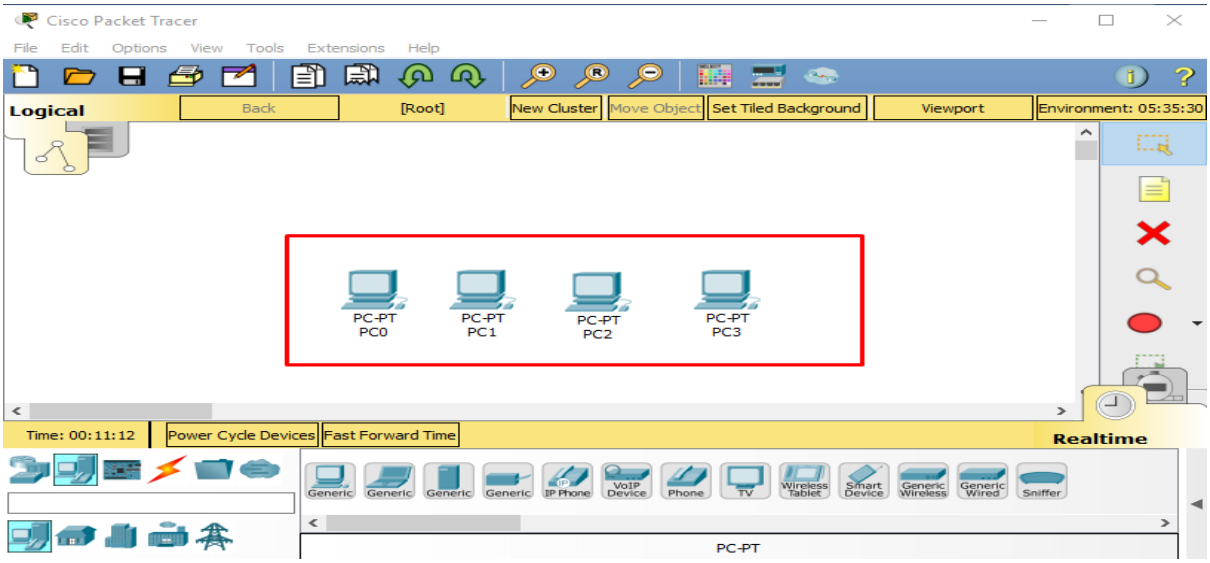


Figure 13: selection of further three generic hosts

5.3 Adding a Hub

Select a hub, by clicking once on Hubs and once on a Generic hub.

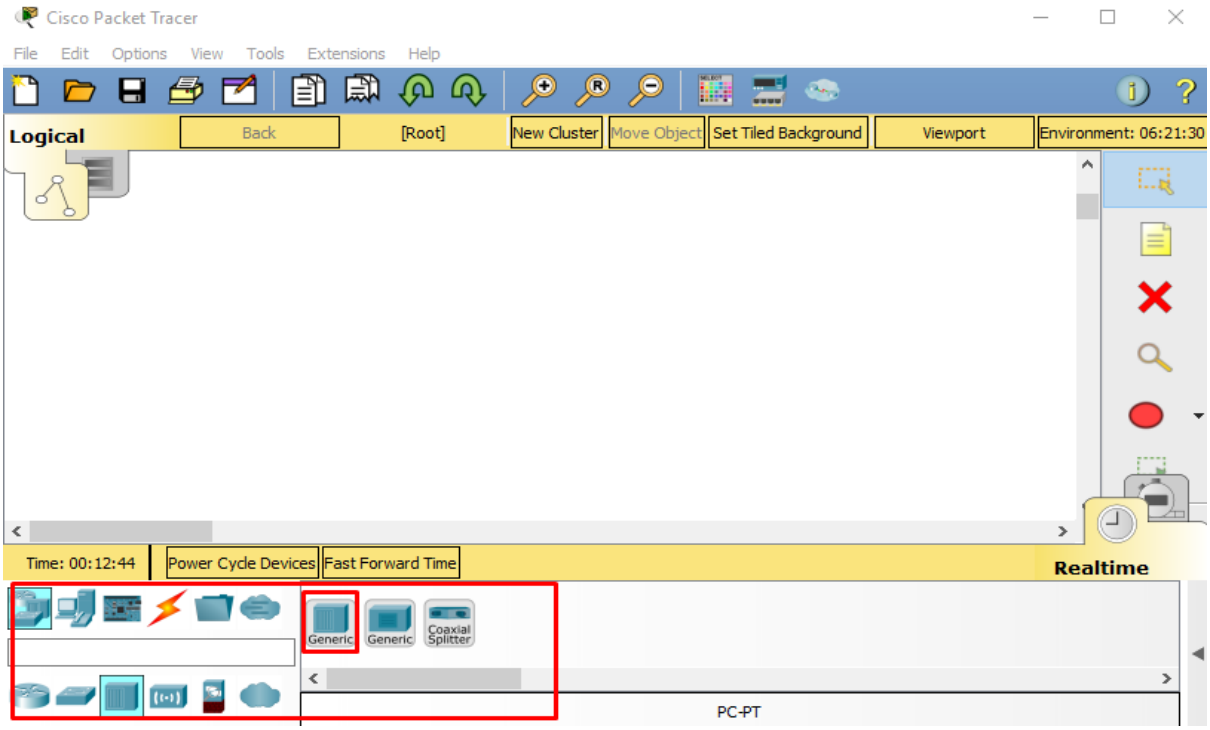


Figure 14: selection of Hub

Add the hub by moving the plus sign "+" below PC0 and PC1 and click once.

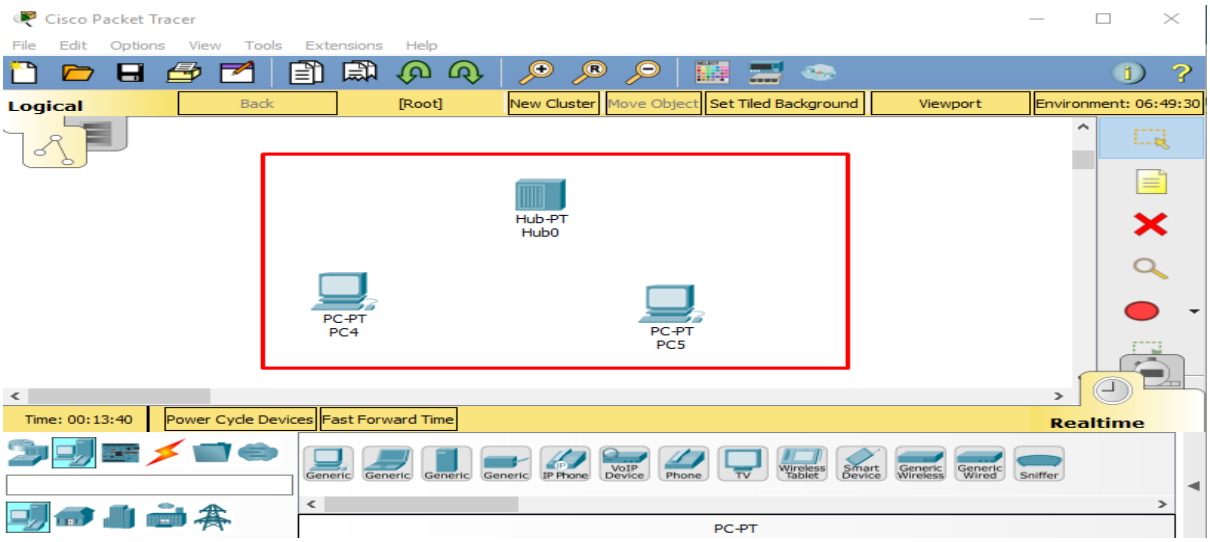


Figure 15: Adding PC'S with Hubs

Connect PC0 to Hub0 by first choosing Connections.

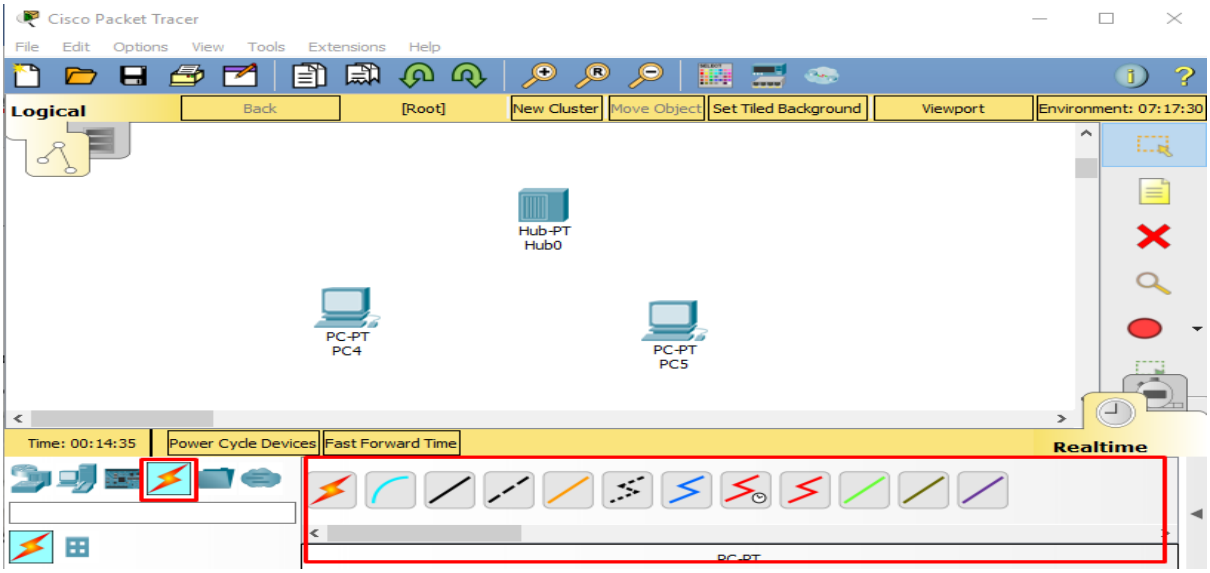


Figure 16: Showing how to select connections

Click once on the Copper Straight-through cable.

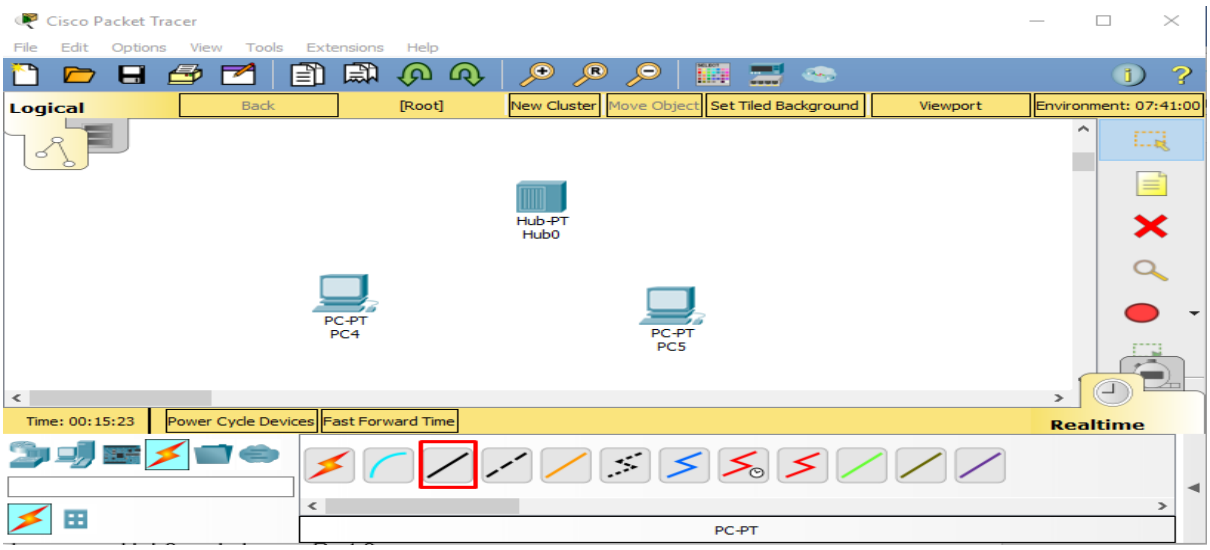
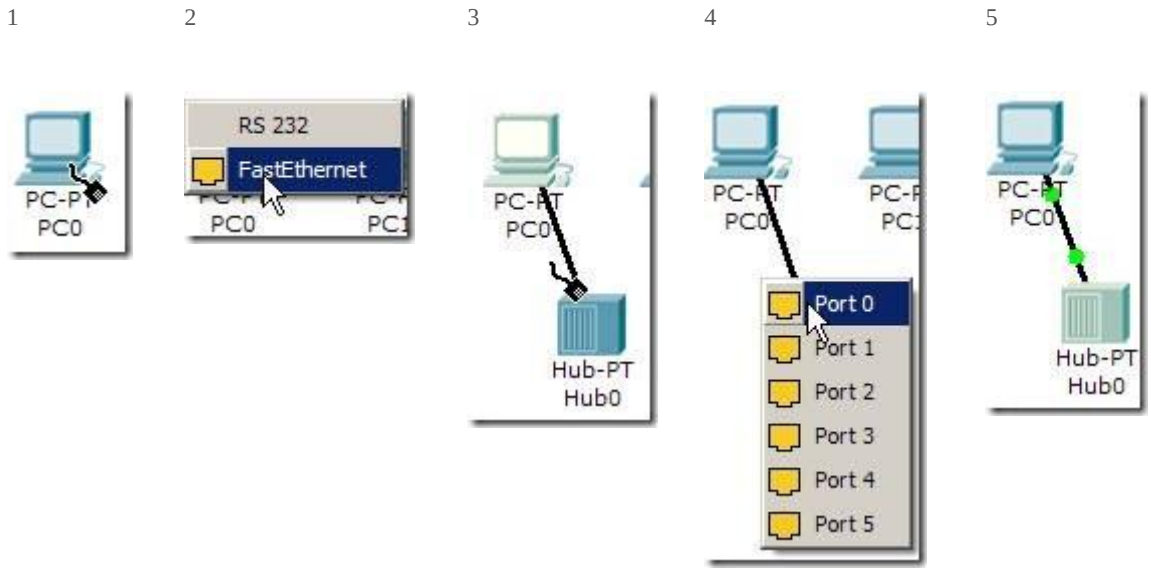


Figure 17: Selection of copper wire

Perform the following steps to connect PC0 to Hub0:

1. Click once on PC0

2. Choose FastEthernet
3. Drag the cursor to Hub0
4. Click once on Hub0 and choose Port 0
5. Notice the green link lights on both the PC0 Ethernet NIC and the Hub0 Port 0 showing that the link is active.



Repeat the steps above for PC1 connecting it to Port 1 on Hub0. (The actual hub port you choose does not matter.

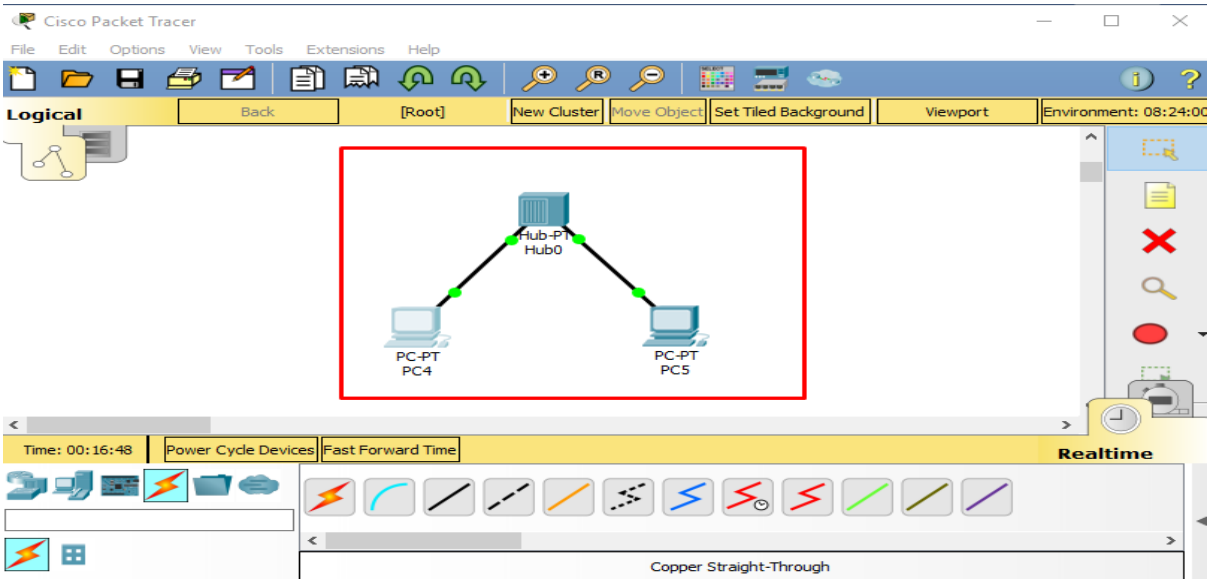


Figure 18: Connecting through copper wire

5.4 Adding a Switch

Select a switch, by clicking once on Switches and once on a 2950-24 switch.

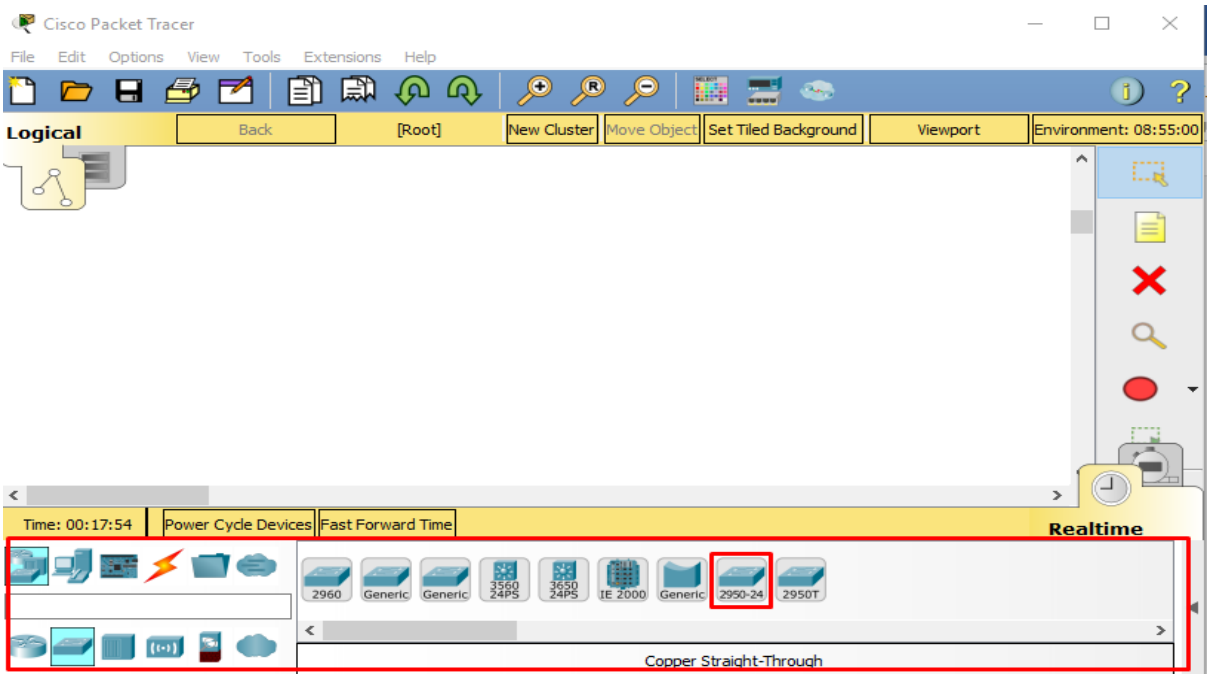


Figure 19: Selection of switch

Add the switch by moving the plus sign “+” below PC2 and PC3 and click once.

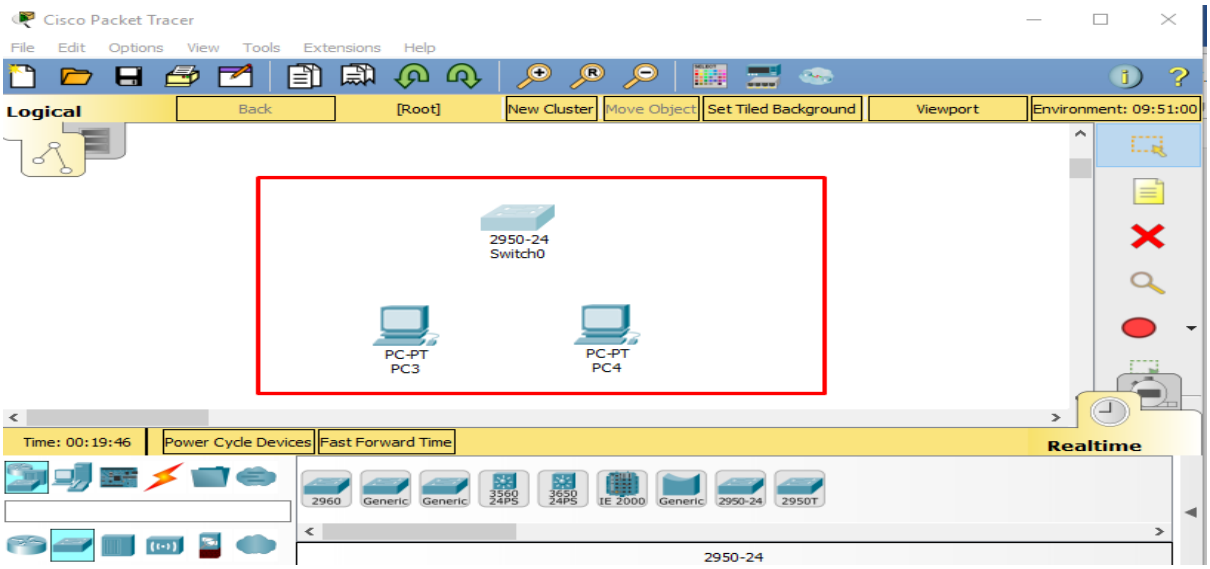


Figure 20: Selecting two PC'S and Switch

Connect PC3 to switch0 by first choosing Connections. Click once on the CopperStraight-through cable.

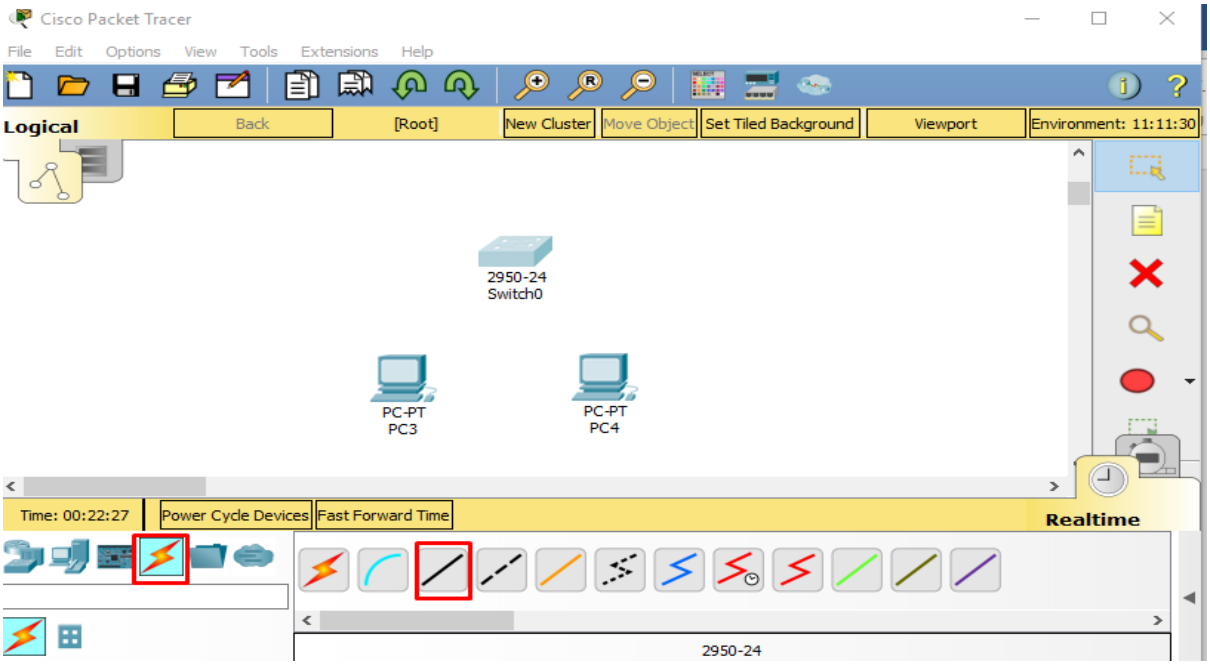


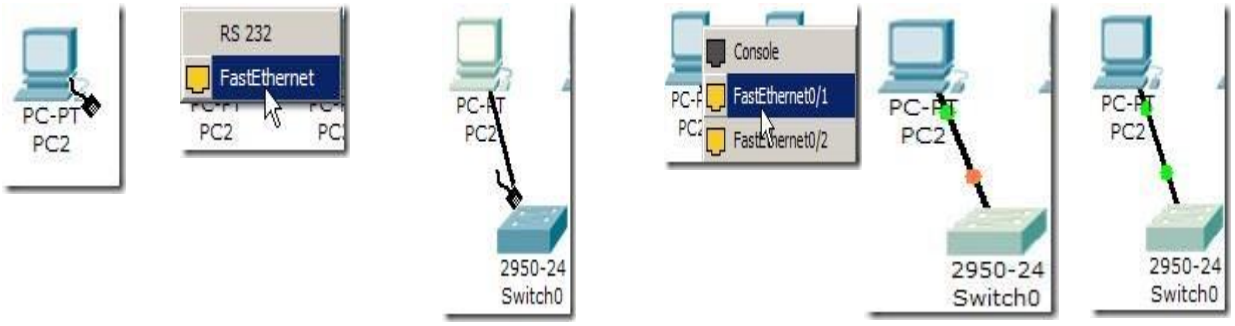
Figure 21: Selecting copper wire

Perform the following steps to connect PC2 to Switch0*:*

1. Click once on PC3

2. Choose FastEthernet
3. Drag the cursor to Switch0
4. Click once on Switch0 and choose FastEthernet0/1
5. Notice the green link lights on PC4 Ethernet NIC and amber light Switch0 FastEthernet0/1 port. The switch port is temporarily not forwarding frames, while it goes through the stages for the Spanning Tree Protocol (STP) process.
6. After a about 30 seconds the amber light will change to green indicating that the port has entered the forwarding stage. Frames can now have forwarded out the switch port.

1 2 3 4 5 6



Repeat the steps above for PC3 connecting it to Port 3 on Switch0 on port FastEtherent0/2. (The actual switch port you choose does not matter.)

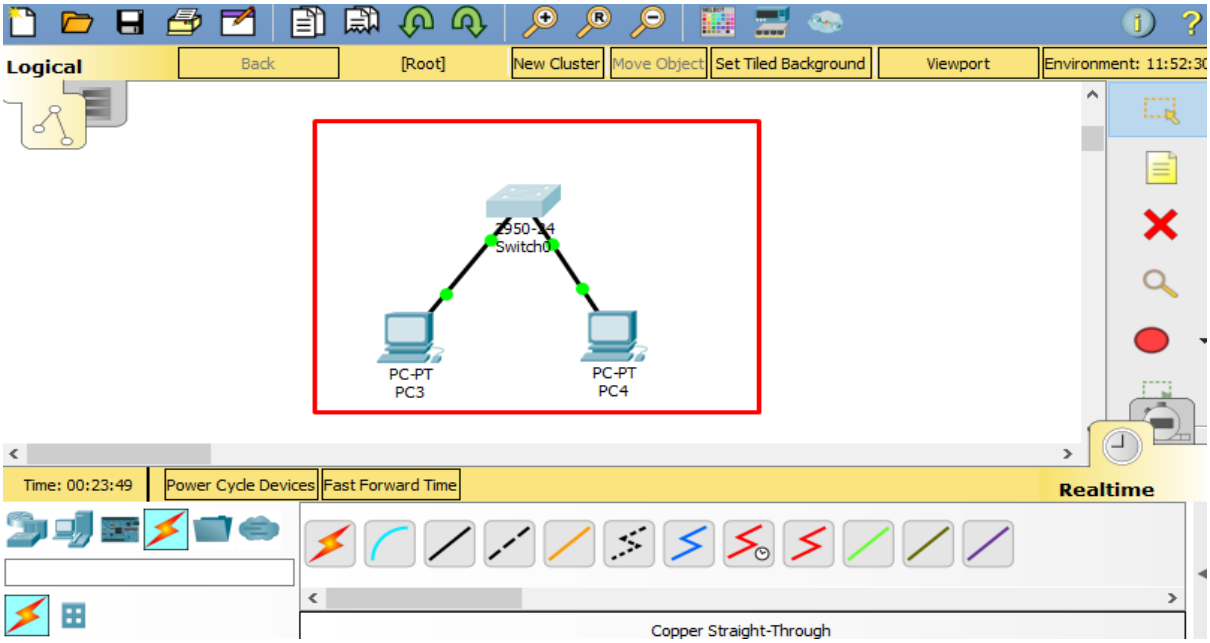


Figure 22: Connecting Pc's with switch through copper wire

Move the cursor over the link light to view the port number. Fa means FastEthernet, 100 Mbps Ethernet.

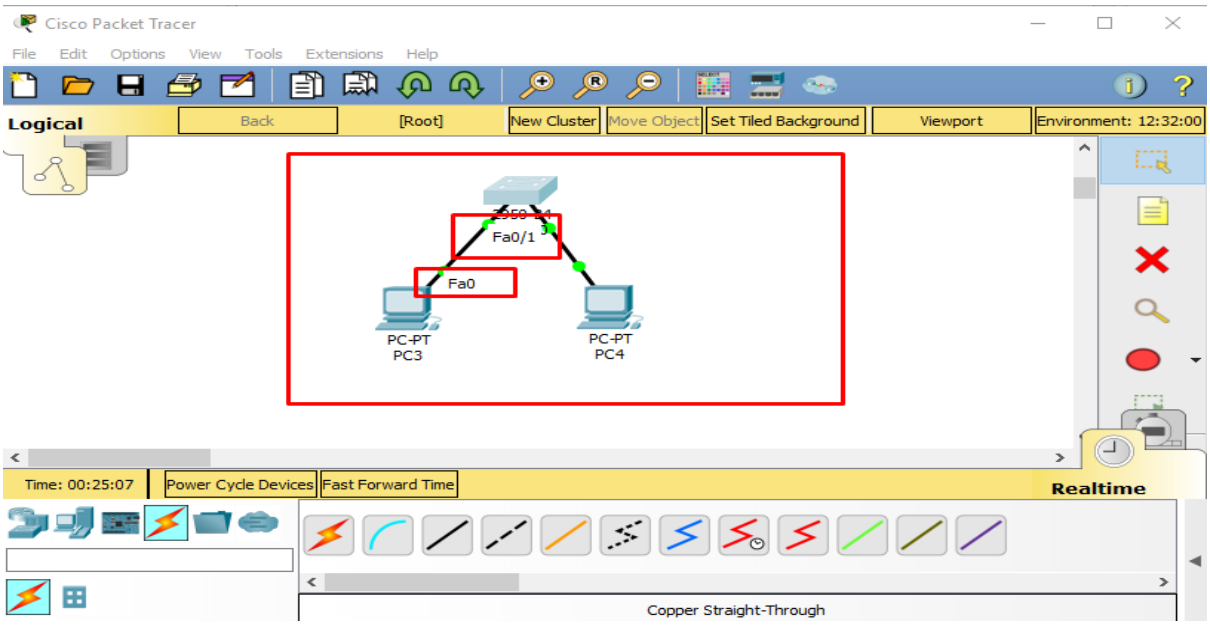


Figure 23: Showing Interfaces

After you successfully create the topology like here

Be sure you are in Realtime mode.

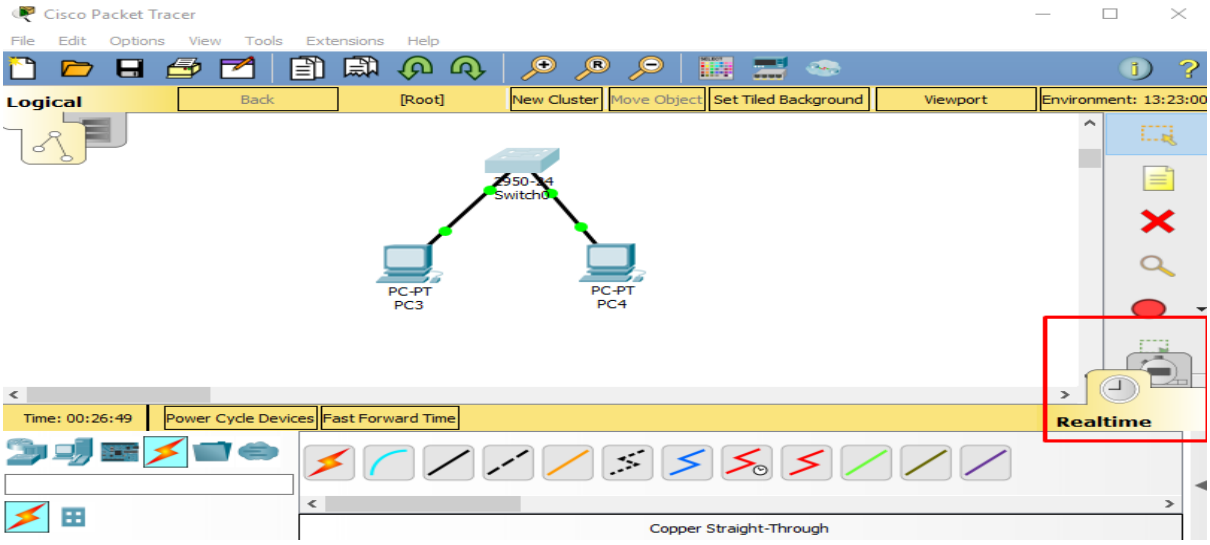


Figure 24: Showing Real time Mode

Select the Add Simple PDU tool used to ping devices.

Assigning IP addresses:

After connecting devices with switch, now for checking them you have to assign IP address to end devices, which is our case is PC0 and PC1 or either one you have, how you will assign IP address follow the following steps:

1. Click on PC0 once.
2. Select Desktop tap when terminal open on above tab.
3. You will have a multiple tab in front of you, select IP configuration
4. Enter valid IP addresses, subnet mask and default gateway.

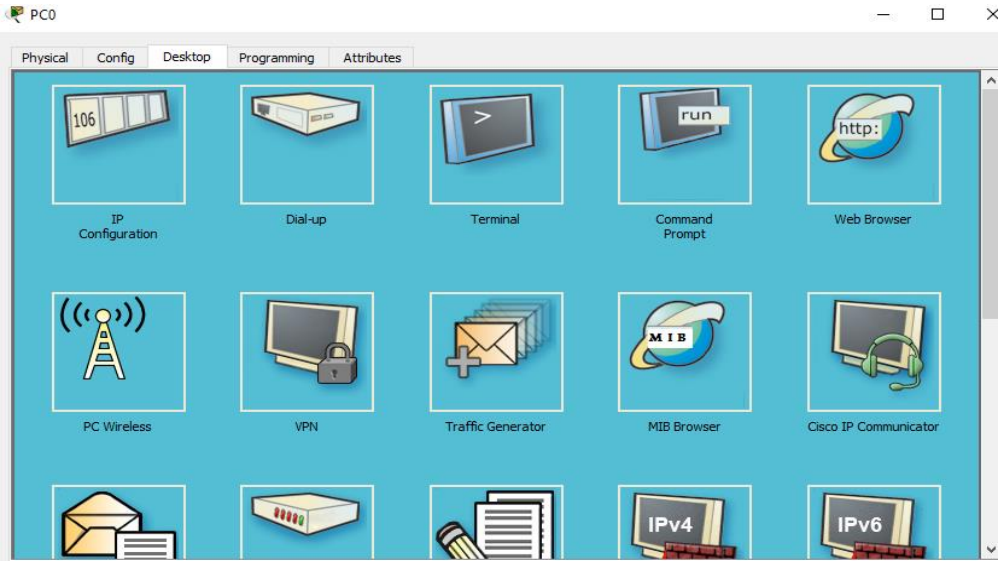


Figure 25: Showing Desktop of PC

Select IP configuration, the first tab then,

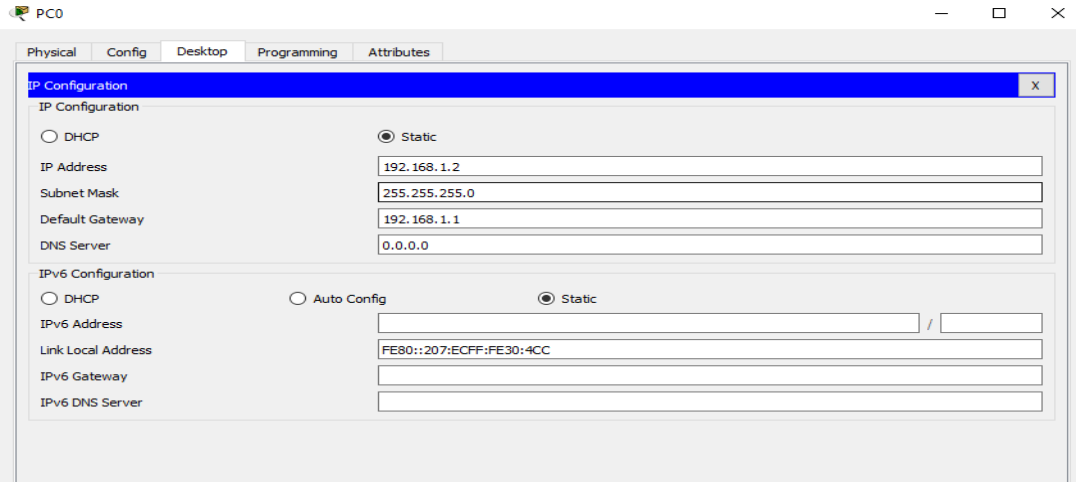


Figure 26: IP configuration

And close the window by filling up with the valid IP addresses, subnet mask and default gateway.

Do same for the next PC1 and enter the valid IP addresses, subnet mask and default gateway.

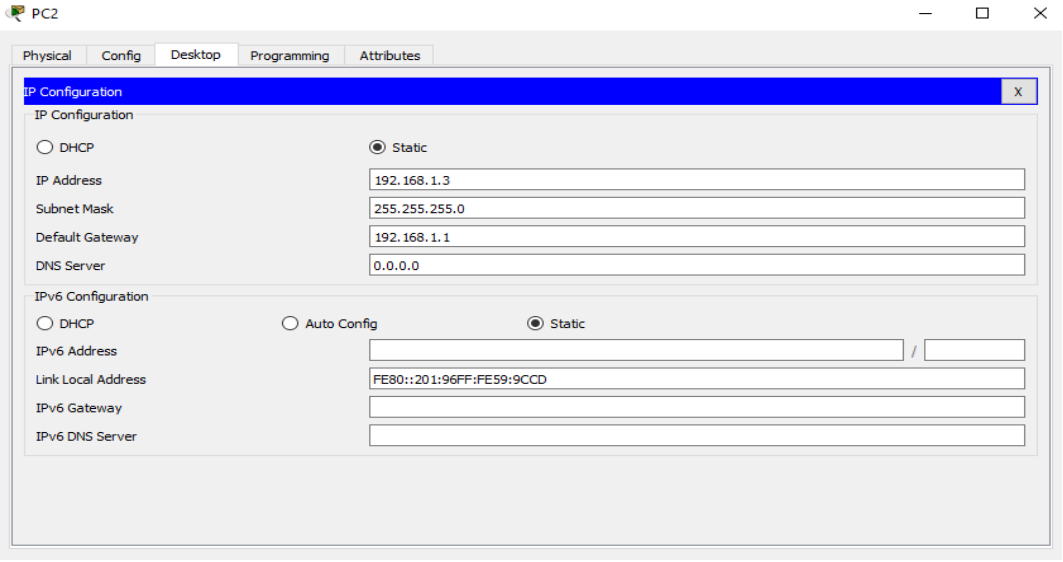


Figure 27: IP configuration of other PC

Results:

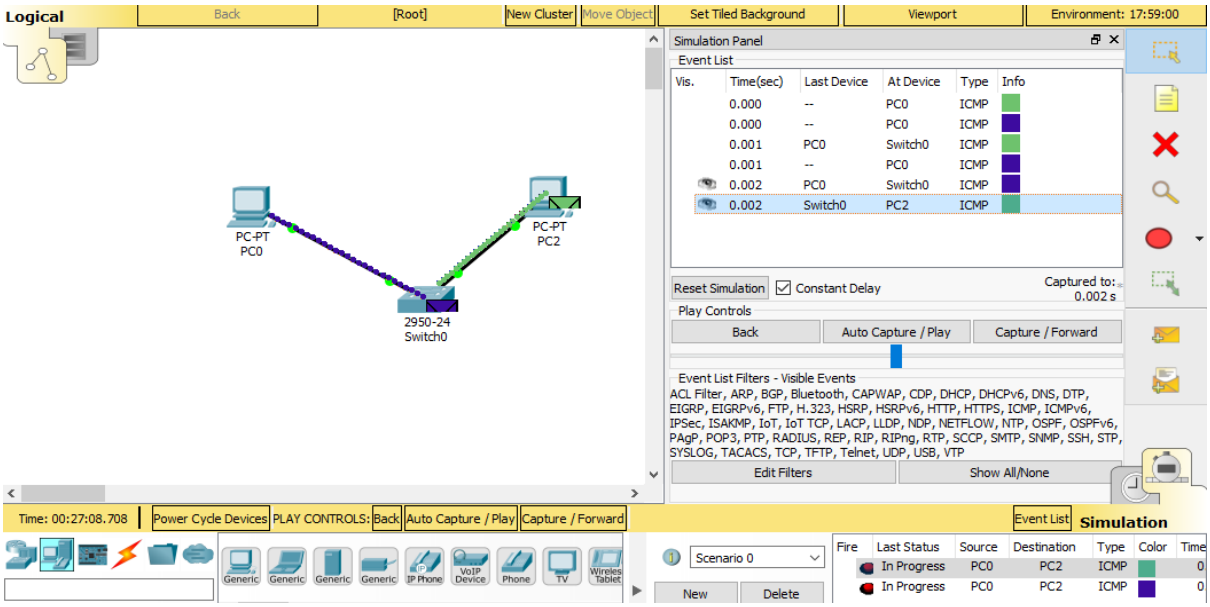


Figure 28: Results showing packet sending

Click once on PC0, then once on PC3.
The PDU Last Status should show as Successful.

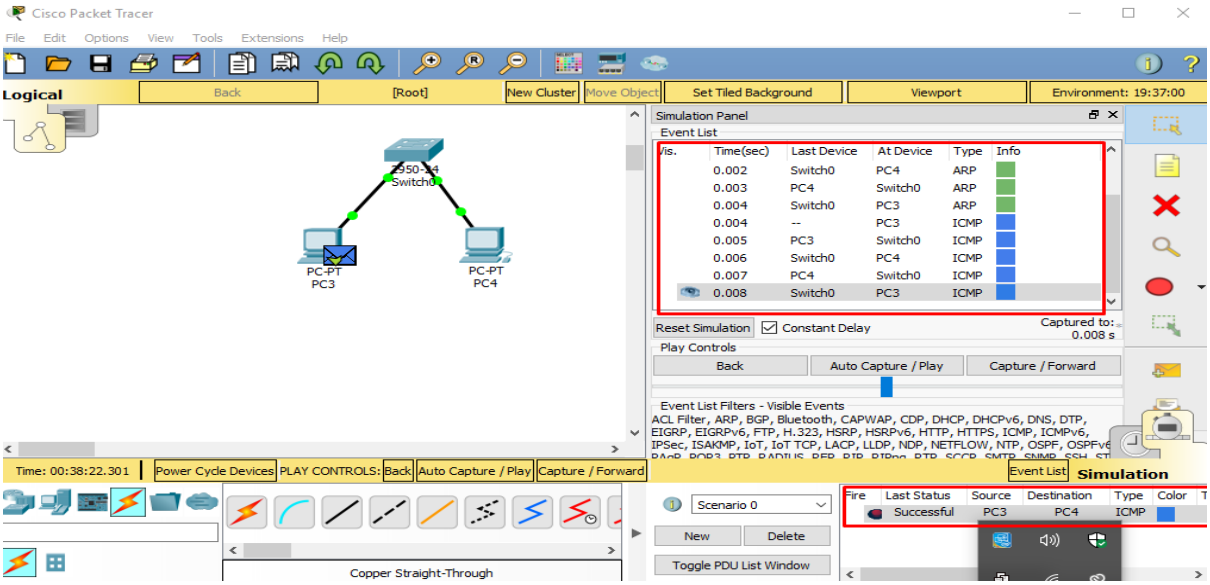


Figure 29: shows successful packet sending

PART-A TASKS:

1. Run **ipconfig/all** from a Command Prompt window.
2. Click **Start**, then **Run**, then type "cmd" in the text box
3. Type in **ipconfig/all** in the Command Prompt Windows.

i. What is your machine's IP address?

_____

ii. What is the class of its address?

_____

iii. Is this a local or global address?

_____

iv. What is the network mask?

_____

v. Is Subnetting used?

_____

vi. What is the host number, the network number, and, if applicable, the subnet number?

_____

vii. Can you determine the broadcast address? If so, what is it?

_____

viii. What is the host name and network name for the computer?

_____

ix. What is the default gateway for the computer?

_____

x. What is the data-link address?

_____

xi. Can you determine if DHCP is used? If so, what are the DNS parameters?

_____

xii. Compare your machine's IP and MAC address with another computer and point the difference?

_____

PART-C TASKS:

Task 1:

Construct a network topology which have one switch connected with 3 computers and assign them proper IP addresses, subnet mask and default gateways.

Task 2:

Construct a network topology having one switch with connected with 5 PC’s with Fast Ethernet Cable, assign them proper IP addresses, subnet mask and default gateways and send message from PC5 to PC1 and demonstrate the simulation.