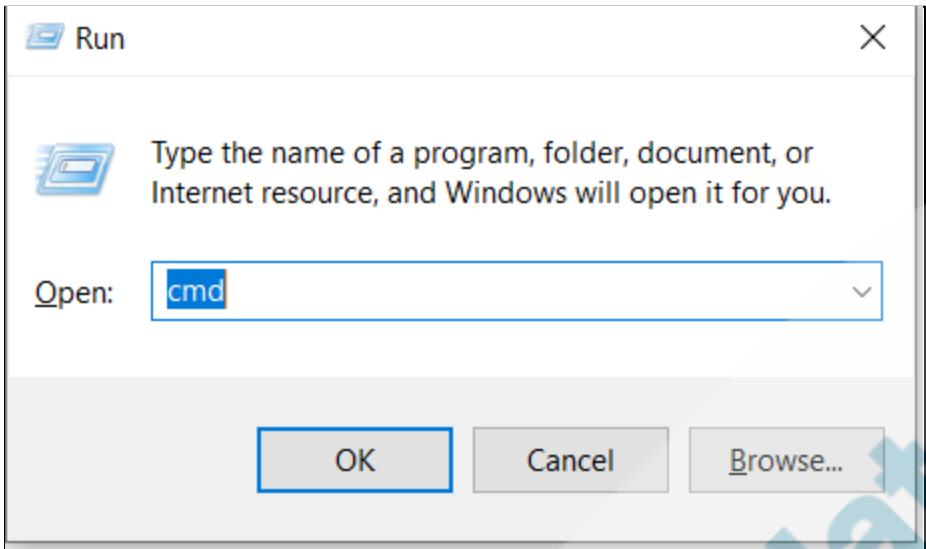
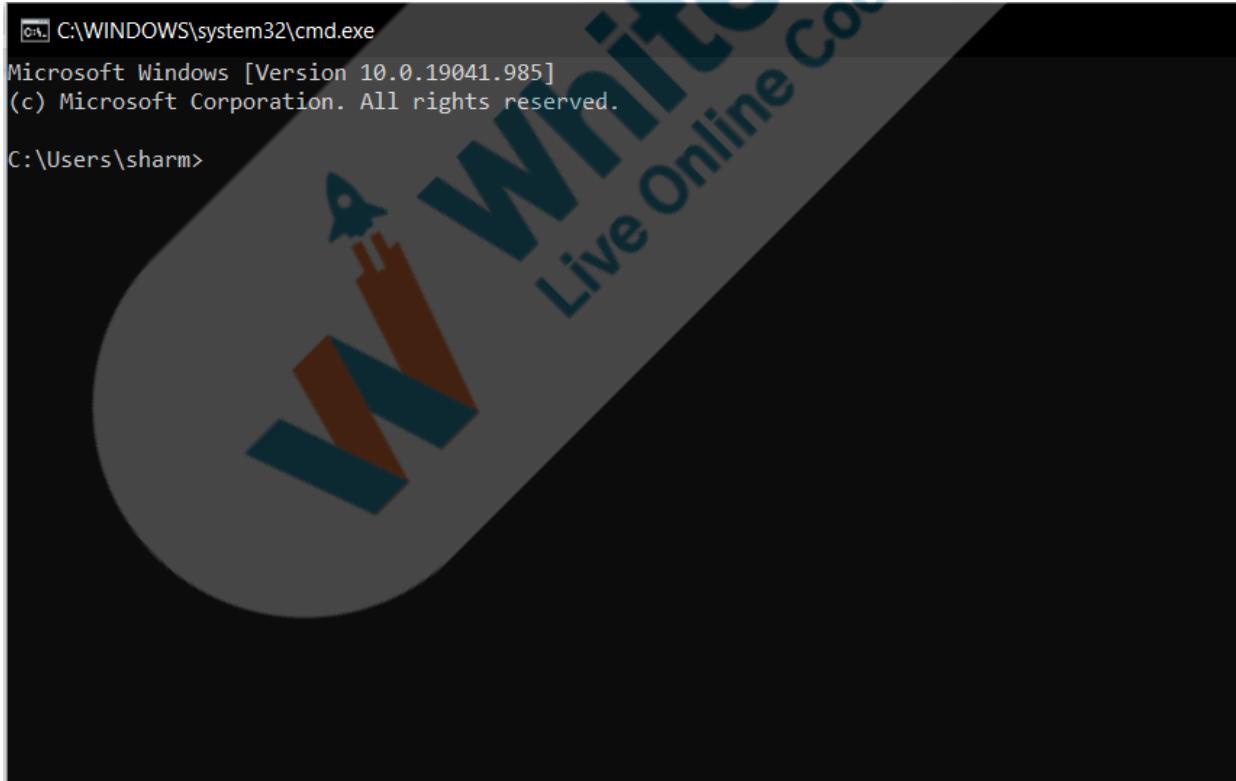


Topic	LAN with Switch		
Class Description	Students will learn to build a local area network of 3 computers connected via switch. They will also learn about various networking commands on Command Prompt.		
Class	194		
Class time	45 mins		
Goal	<ul style="list-style-type: none"> ● To create LAN using Switch. ● Learn about the mac address 		
Resources Required	<ul style="list-style-type: none"> ● Teacher Resources: <ul style="list-style-type: none"> ○ Laptop with internet connectivity ○ Cisco Packet Tracer ○ Earphones with mic ○ Notebook and pen ○ Smartphone ● Student Resources: <ul style="list-style-type: none"> ○ Laptop with internet connectivity ○ Cisco Packet Tracer ○ Earphones with mic ○ Notebook and pen 		
Class structure	Warm-Up Slides Teacher - led Activity Student - led Activity Wrap-Up Slides		10 mins 10 mins 20 mins 5 mins
WARM-UP SESSION - 10mins			
 Teacher starts slideshow from slides 1 to 16 Refer to speaker notes and follow the instructions on each slide.			

Teacher Action	Student Action
<p>Hey <student's name>. How are you? It's great to see you!</p> <p>Are you excited to learn something new today?</p> <p>Run the presentation from slide 1 to slide 3.</p> <p>Following are the warm up session deliverables: Greet Students and revise the concepts from the previous class.</p>	<p>ESR: Hi, thanks, Yes I am excited about it!</p> <p>Click on the slide show tab and present the slides</p>
QnA Session	
Question	Answer
<p>Which of the following is used to communicate with the server ?</p> <ul style="list-style-type: none"> A. Wifi B. Router C. Scanner D. Printer 	B.
<p>IP stands for _____.</p> <ul style="list-style-type: none"> A. Internet Protection B. Internet Passage C. Internet Protocol D. Intellectual Protocol 	C.
Continue the warm up session	
Teacher Action	Student Action

<p>Run the presentation from slide 3 to slide 16 to set the problem statement.</p> <p>Following are the warm up session deliverables:</p> <ul style="list-style-type: none"> • Introduction to LAN with Switch 	<p>Narrate the story by using hand gestures and voice modulation methods to bring in more interest in students.</p>
●  <p>Teacher ends slideshow</p>	
<p>TEACHER-LED ACTIVITY - 10mins</p>	
<p>Teacher Initiates Screen Share</p>	
<p><u>ACTIVITY</u></p> <ul style="list-style-type: none"> • Learn about Networking commands. • Find Mac address of computer. 	
Teacher Action	Student Action
<p>Add the explanation of the mac address.</p> <p>In the last class, we got started with Cisco packet Tracer and we also learned how the internet works.</p> <p>In this class we are going to explore a few networking commands in the command prompt(in windows) , terminal in macos.</p> <p>Networking commands are a great tool to diagnose network issues and find details.</p> <p>First of all let's open the command prompt/terminal.</p> <p>To open the command prompt press windows + r key.</p> <p>This will open the run option. Here type cmd and press enter.</p>	

	Press enter this will open the command prompt.
	
Process to open terminal in mac os.	

<p>We have the terminal ready. Now the first command we want to explore is to find the ip address of our computer. To find the IP of any computer type ipconfig in the command prompt for the window.</p> <p>If you are using mac os or linux type ifconfig.</p> <p>After typing the command press enter.</p> <p>You will see lots of details here.</p> <p>If you scroll a little bit down you will see information like wireless Lan adapter Wi-fi.</p> <p>This gives us information about your connection.</p> <p>First is the IPv4 address, which is your ip address in my case it is 192.68.1.102 The ip address is assigned by your router/dongle.</p> <p>If you connect to a different wifi your ip address will also change.</p> <p>The next thing we are interested in is the default Gateway. This is the ip address of your wifi router/ dongle.</p> <p>Which in my case is 192.168.1.1.</p> <p>Default gateway is the first step in connecting your computer with the internet.</p> <p>We will see the practical use of the default gateway when we will build a simulation.</p>	
---	--

```
Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . . . . . : 
IPv6 Address . . . . . : 2401:4900:2103:bdd9:d0a9:f3b6:f4c1:a852
Temporary IPv6 Address . . . . . : 2401:4900:2103:bdd9:d19e:9bb7:4a7c:1a47
Link-local IPv6 Address . . . . . : fe80::d0a9:f3b6:f4c1:a852%5
IPv4 Address . . . . . : 192.168.1.102
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::6471:53ff:fe9c:2219%5
                                         192.168.1.1
```

<p>Can you tell me if you want to open a website. What are the steps you need to take?</p> <p>Very good ! It is so easy to open any website for us.</p>	<p>ESR:</p> <ol style="list-style-type: none"> 1. Open the browser. 2. Type website name 3. Press enter.
---	--

But the computer has to perform a lot of functions to find the website on the internet and show the details on your browser.

As we discussed in the last class, the internet is a collection of billions of computers connected with each other.

So our website, let's say www.amazon.com is also stored on a computer.

But how do we find the website?

Like your computer has an ip address, websites are also assigned an IP address. With help of this IP address we can reach that website and access the data.

But how can we find the IP address of a website.

To do that we can use a command.

This command is called.

Nslookup to use this command type it in the cmd and after that add the name of the website such as nslookup

www.amazon.com

Press enter and it will show the ip address of google.

In this way you can find the IP address of any website.

```
C:\WINDOWS\system32\cmd.exe
C:\Users\sharm>nslookup www.amazon.com
Server: UnKnown
Address: 2401:4900:2103:bdd9:6471:53ff:fe9c:2219

Non-authoritative answer:
Name: e15316.a.akamaiedge.net
Address: 104.115.93.185
Aliases: www.amazon.com
          tp.47cf2c8c9-frontier.amazon.com
          www.amazon.com.edgekey.net
```

104.115.93.185 is the IP address of www.amazon.com.
We got the IP but to check that we can connect with this

website or not.

Can you guess the command for that?

Very Good we are going to use the ping command to ping amazon.com or 104.115.93.185

We can clear the cmd by using the **cls** command.

To run the ping command type ping 104.115.93.185 and press enter.

This will send the 4 data packets to amazon.com and then receive the 4 packets. This will also give us information about the latency of the network.

It shows how much time it took to receive each packet in milliseconds.

Lower this number faster is the connection.

ESR:

Ping command

```
C:\WINDOWS\system32\cmd.exe
C:\Users\sharm>ping 104.115.93.185

Pinging 104.115.93.185 with 32 bytes of data:
Reply from 104.115.93.185: bytes=32 time=101ms TTL=58
Reply from 104.115.93.185: bytes=32 time=67ms TTL=58
Reply from 104.115.93.185: bytes=32 time=66ms TTL=58
Reply from 104.115.93.185: bytes=32 time=71ms TTL=58

Ping statistics for 104.115.93.185:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
        Minimum = 66ms, Maximum = 101ms, Average = 76ms
```

Great, we learnt about how to find the IP address of the website and ping to check whether we can connect with the website or not.

We have seen that each website and device is assigned an IP address. With the help of this address we can locate that device on the network.

But the IP address gets changed when we change the network and the user can set the IP address on its own. We also need an address which is constant and no one can change it.

That is where the mac address comes into the picture. It is also called a physical address. Because it is assigned by the manufacturers of the device and it cannot be changed. All the devices which can connect to a network need a mac address.

Mac stands for Media Access Control.

To see the mac address of our computer we can simply type a command in the command prompt as **ipconfig /all** (**ifconfig /all for mac os**).

Here you will see a lot of information. The mac address is called a physical address.

But you can see that we have multiple mac addresses here. This is because each networking device in the computer has a mac address.

The computer has an ethernet device, which helps us to connect with networking using a LAN cable.

Then we have a wifi module and bluetooth module as well. So all of these devices are assigned a mac address.

```
Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . . . . . : 
Description . . . . . : Intel(R) Wireless-AC 9560 160MHz
Physical Address. . . . . : D0-AB-D5-22-FF-29
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . . : Yes
IPv6 Address. . . . . : 2401:4900:2105:8f39:d0a9:f3b6:f4c1:a852(Preferred)
Temporary IPv6 Address. . . . . : 2401:4900:2105:8f39:bc11:dd72:a35f:ff06(Preferred)
Link-local IPv6 Address . . . . . : fe80::d0a9:f3b6:f4c1:a852%5(Preferred)
IPv4 Address. . . . . : 192.168.1.101(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : 01 June 2021 09:37:45
Lease Expires . . . . . : 02 June 2021 09:41:38
Default Gateway . . . . . : fe80::3851:f0ff:fe1b:df97%
                           192.168.1.1
DHCP Server . . . . . : 192.168.1.1
DHCPv6 IAID . . . . . : 248556501
DHCPv6 Client DUID. . . . . : 00-01-00-01-24-9A-1C-DE-08-97-98-6A-5D-6B
DNS Servers . . . . . : 2401:4900:2105:8f39:3851:f0ff:fe1b:df97
                           2401:4900:2105:8f39:3851:f0ff:fe1b:df97
                           192.168.1.1
```

This is the mac address of the wifi module of my computer. The Mac address is a 12 digit hexadecimal number.

<p>The first 6 digits of the mac address tells us about the manufacturers. So these will be the same for all the devices made by that manufacturer.</p> <p>Rest of the 6 digits are unique for each device.</p> <p>2 devices can not have the same mac address.</p>	
---	--

Now we are going to create a network in the Cisco packet Tracer.

In the last class we only connected 2 computers, but now we are going to connect more than 2 computers using a switch.

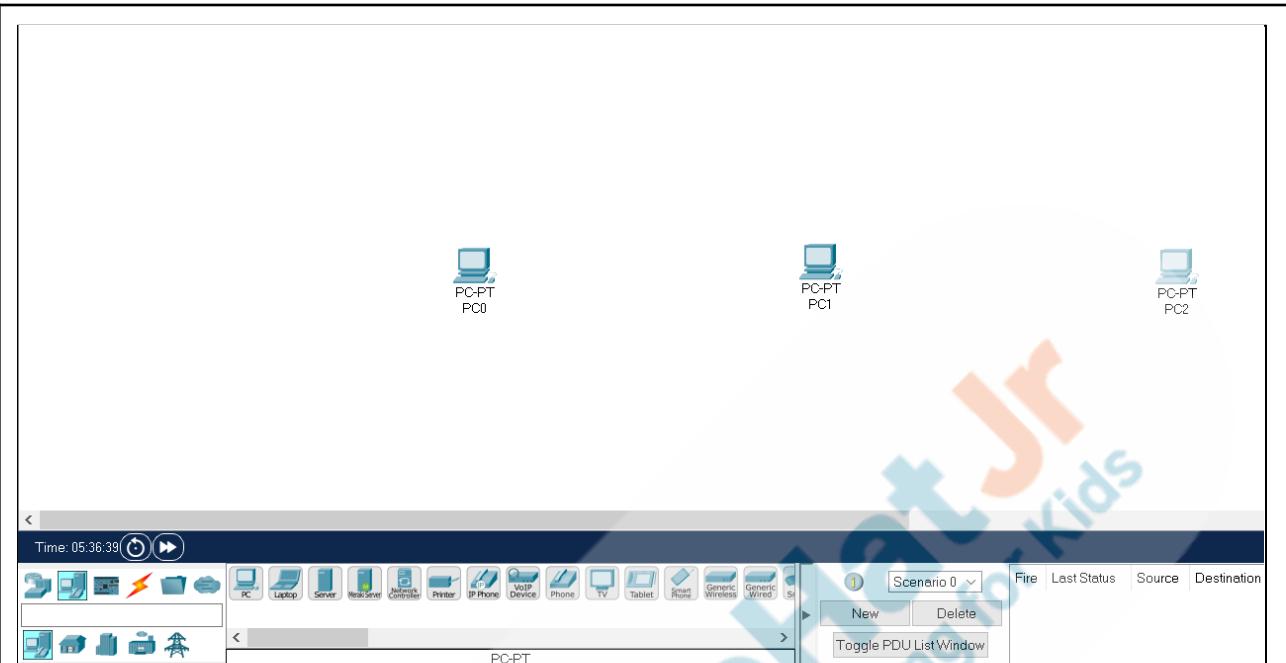
Switch is a networking device which helps us to connect multiple devices together and forms a LAN(local Area Network).

Switch is a very smart device which stores the mac address of the computers which are connected with it.

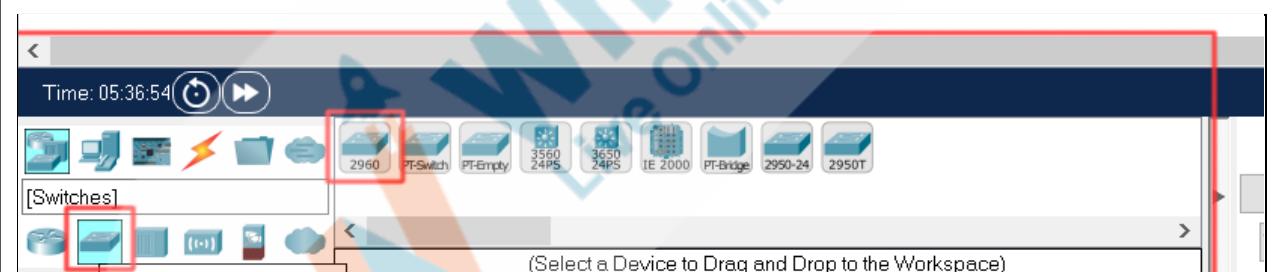
So every time a computer sends something to the switch, Switch knows the mac address of that computer.

Switches are very helpful when we create networks for homes,schools etc.

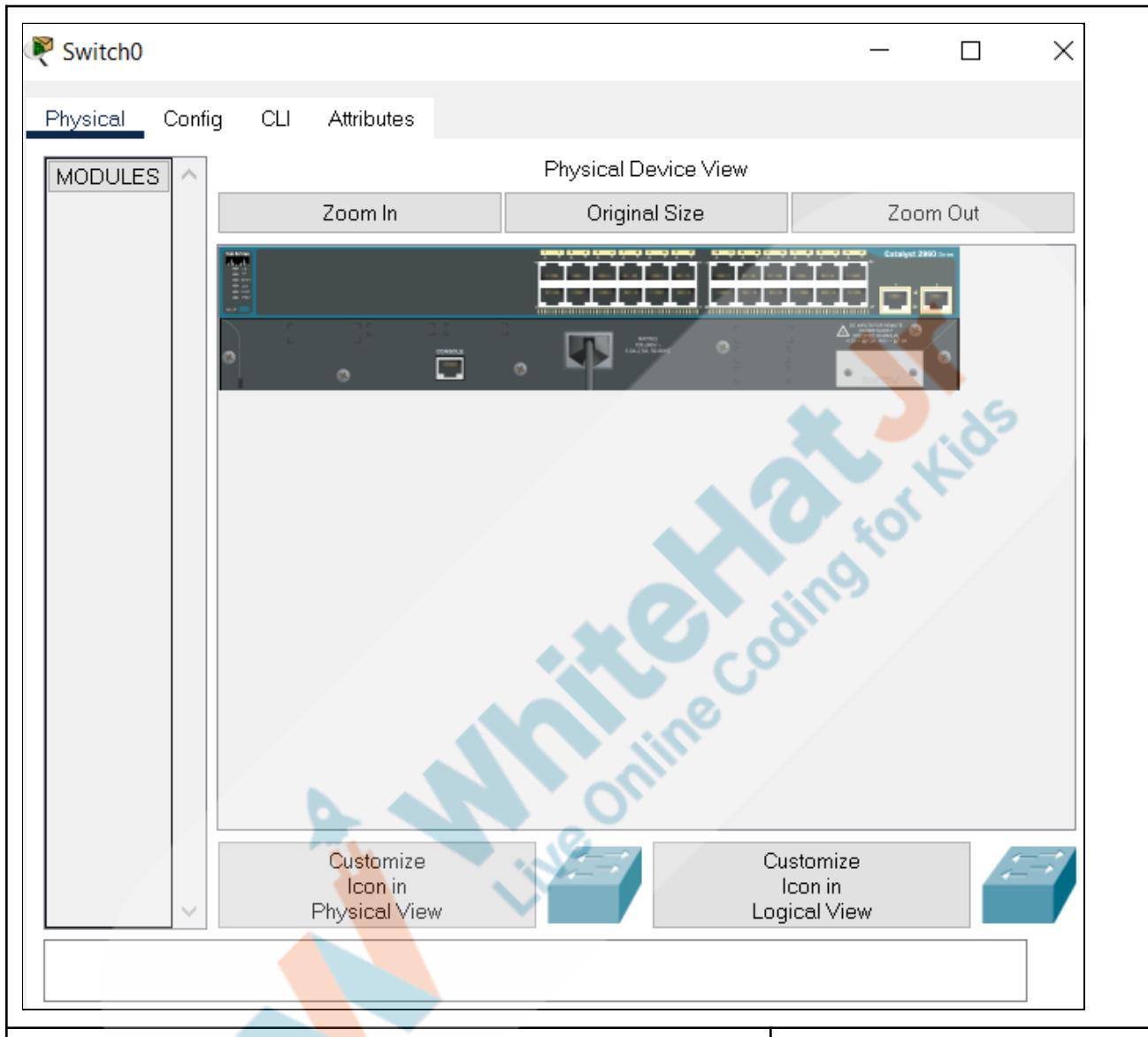
<p>Let's open the Cisco Packet Tracer.</p> <p>Drag and drop the 3 computers on the screen..</p>	
---	--



Now go the switches option and drag and drop the first switch which is named 2960.

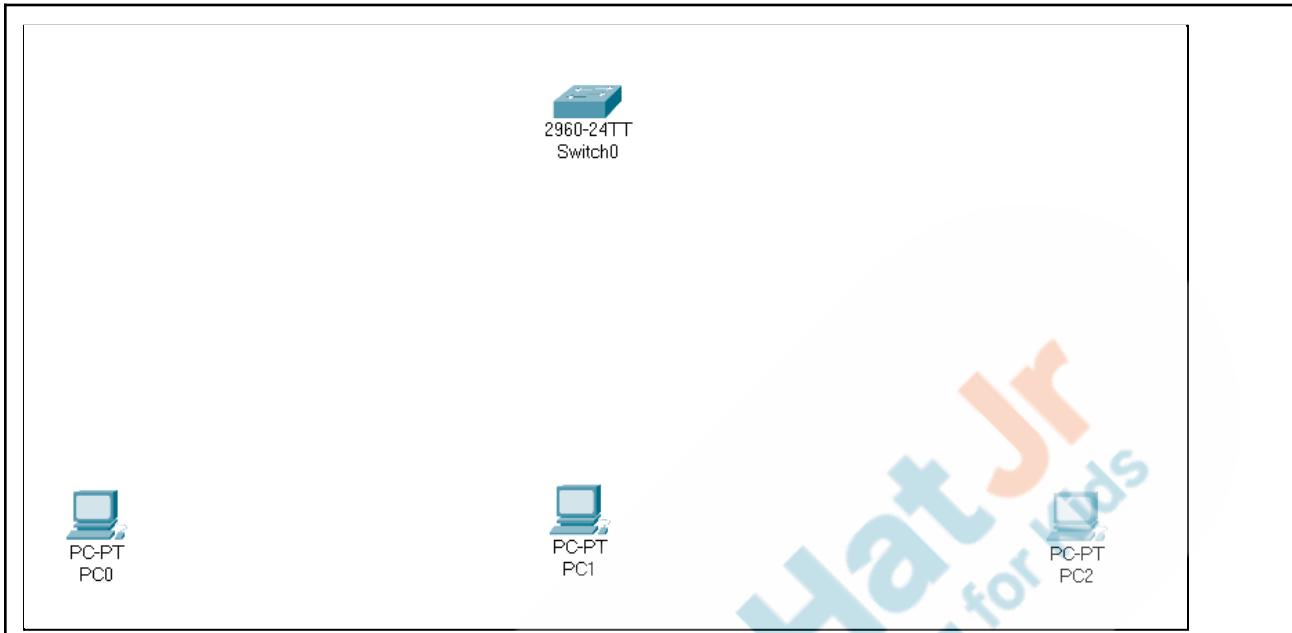


Switch has multiple ports to connect LAN cables. If we double click on the switch then we can see how it will look in real life.



The screenshot shows a network simulation interface titled "Switch0". On the left, there's a sidebar with tabs for "Physical", "Config", "CLI", and "Attributes", with "Physical" being the active tab. Below the tabs is a "MODULES" section. The main area is titled "Physical Device View" and displays a 16-port Cisco Catalyst 2960 switch. At the bottom of this view are three buttons: "Zoom In", "Original Size", and "Zoom Out". Below the device view are two buttons: "Customize Icon in Physical View" and "Customize Icon in Logical View", each accompanied by a small blue network icon. A large watermark for "WhiteHat Jr Live Online Coding for Kids" is diagonally across the center of the screen.

Now we have our switch and the 3 computers on the screen.



Next step is to connect the computers with a switch and assign the IP address to each computer.

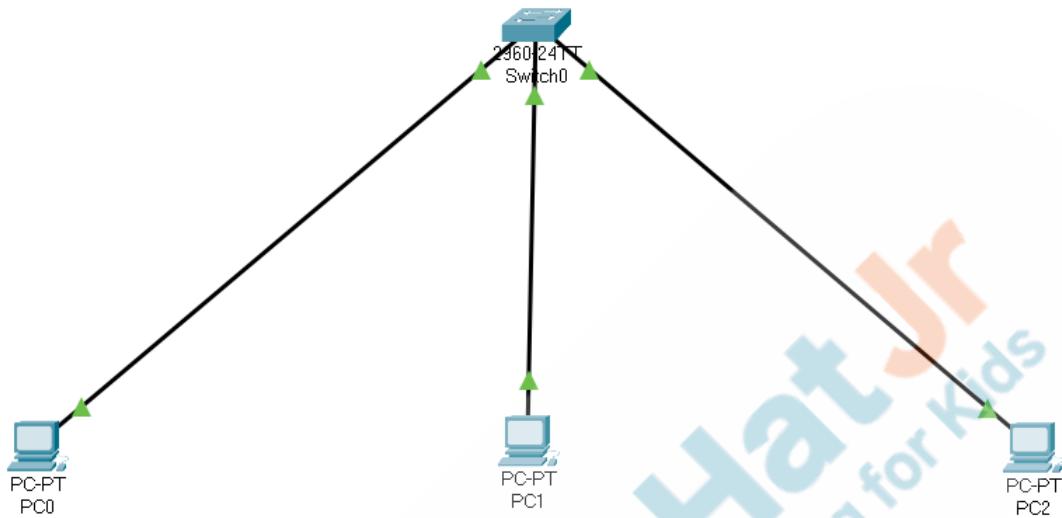
To connect the computers with the switch we need to use connection from the bottom menu.

First select the connection option from the bottom menu and then choose the option of automatically selecting the connection type.



To connect the computer with Switch click on the computer and then click on the switch. We need to do this for the 2 other computers.

Then we will have our network of 3 computers with switch.



The next step is to assign the ip address to the computers and perform a ping test.

Do you want to try that?

Great Please share your screen with me.

ESR:
yes

Teacher Stops Screen Share

STUDENT-LED ACTIVITY - 20mins

- Ask the student to press the ESC key to come back to the panel.
- Guide the student to start Screen Share.
- The teacher gets into Fullscreen.

ACTIVITY

- Assign Ip address to computers in the LAN.
- Add one more computer and configure its IP.
- Check the Mac address table on switch.



Teacher starts slideshow :Slide 17 to Slide 18

Run the presentation for slides to set the student activity context.



Teacher ends slideshow

Teacher Action

In the last activity we have seen how to create a Local Area network with a switch.
 But that network will not work, because we haven't assigned the IP address to the computers.
 Do you know how we assign the IP addresses?

To assign the Ip address to the computer in the CPT, we need to double click that computer and then select the Ipconfig option and then set the ip address.
 This is the same as we did in the last class.

Note:Student will assign the Ip address to all the 3 computers.

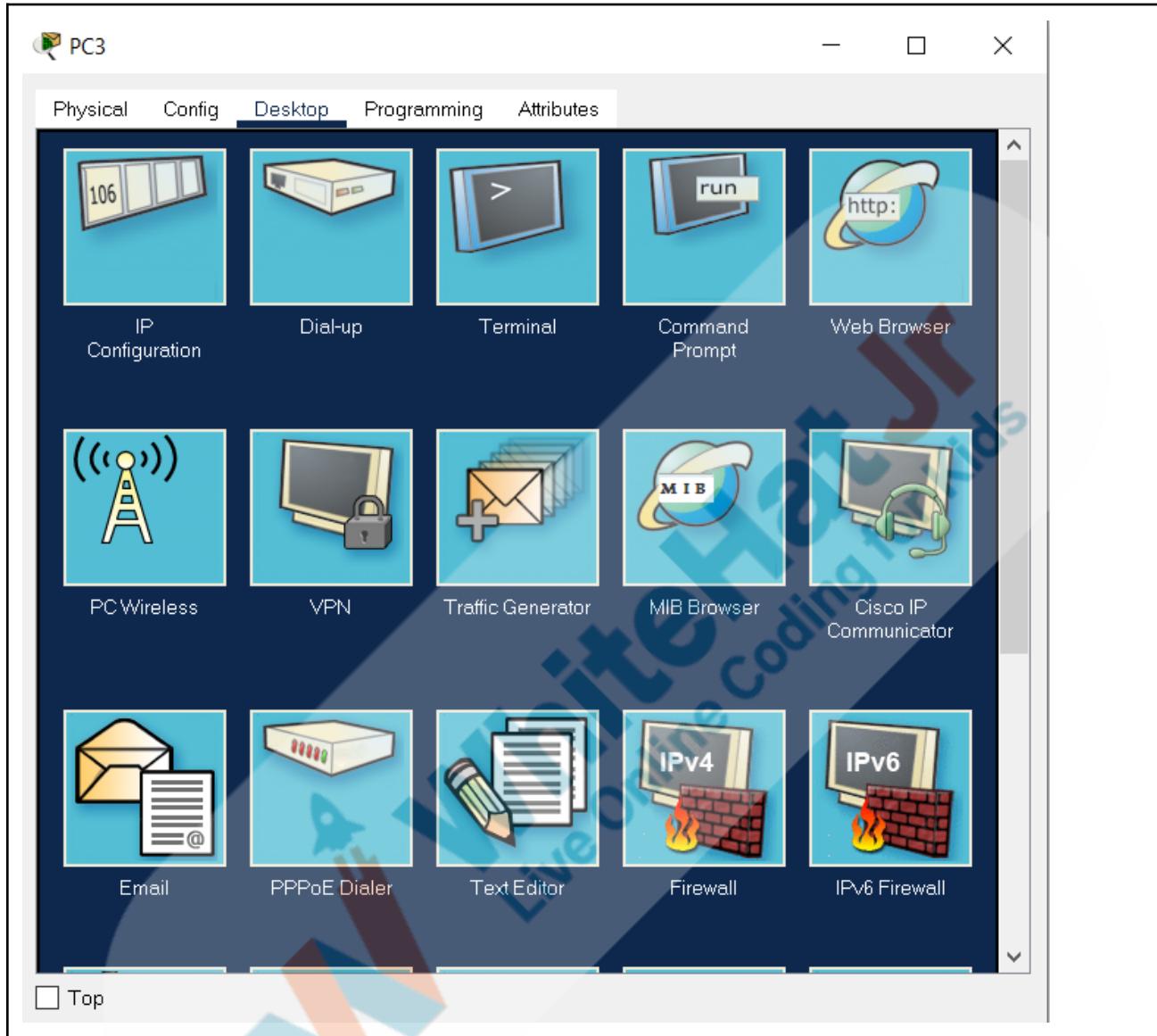
For the first computer set the IP address as 10.0.0.1 and similarly for the next computer set the IP as 10.0.0.2 and 10.0.0.3 respectively.

Student Action

Student downloads the Student Activity 1 file and open in the CPT

ESR:

Varied



PC0

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

DHCP Static

IPv4 Address	10.0.0.1
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
DNS Server	0.0.0.0

IPv6 Configuration

Automatic Static

IPv6 Address	/
Link Local Address	FE80::290:CFF:FE92:9121
Default Gateway	
DNS Server	

802.1X

Use 802.1X Security

Authentication: MD5

Username:

Password:

Top

Once we assigned the IP to all the computers now we can do a ping test to check whether our network is working or not.

Do you know how to ping another computer?

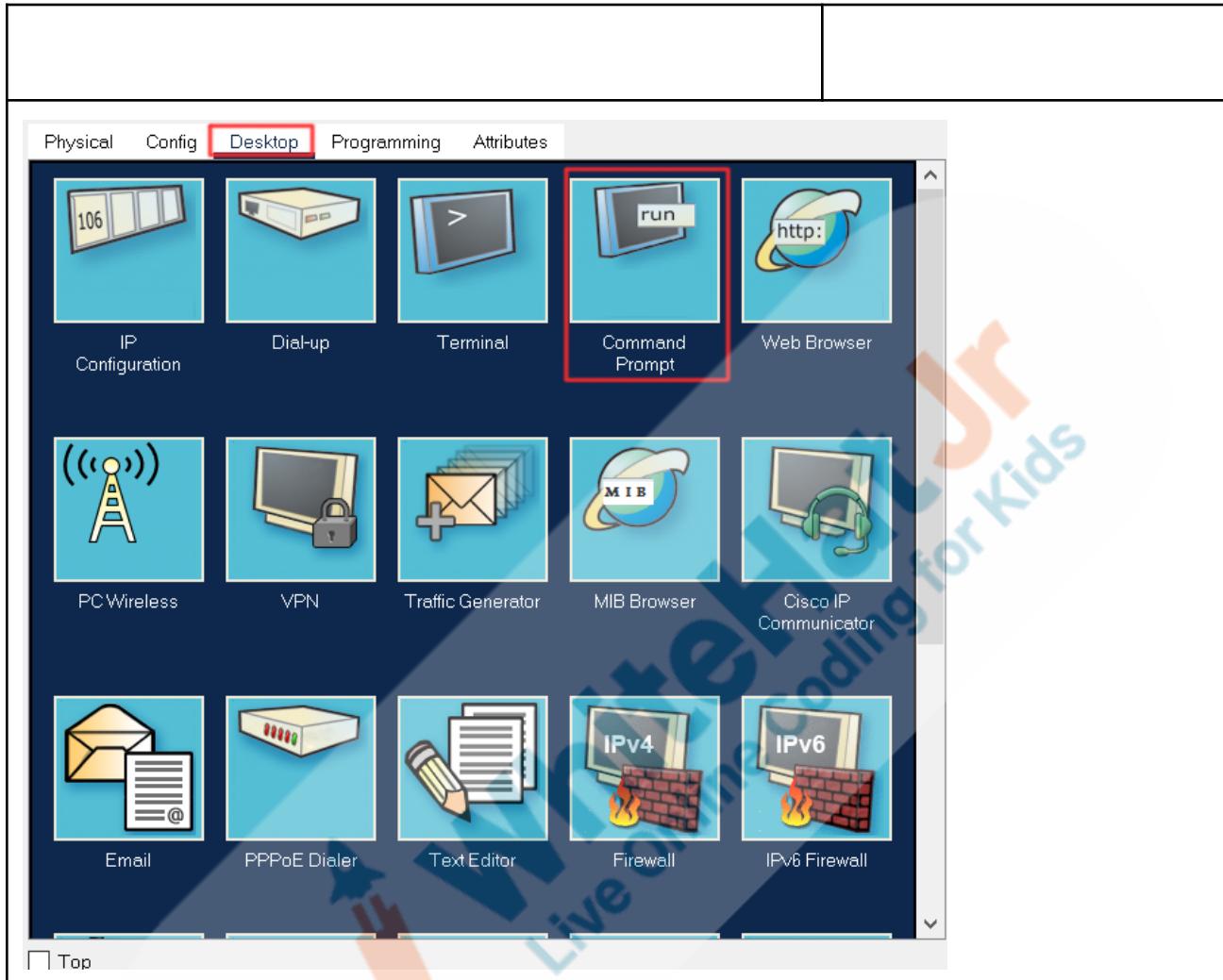
Great!

So we will double click on the first computer and open the command prompt.

Then in the commands prompt write **ping 10.0.0.2** and we will be able to see that our ping is working and we can send and receive data to this computer.

ESR:

Using ping command and the ip of the computer.



Physical Config **Desktop** Programming Attributes

Command Prompt X

```
Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

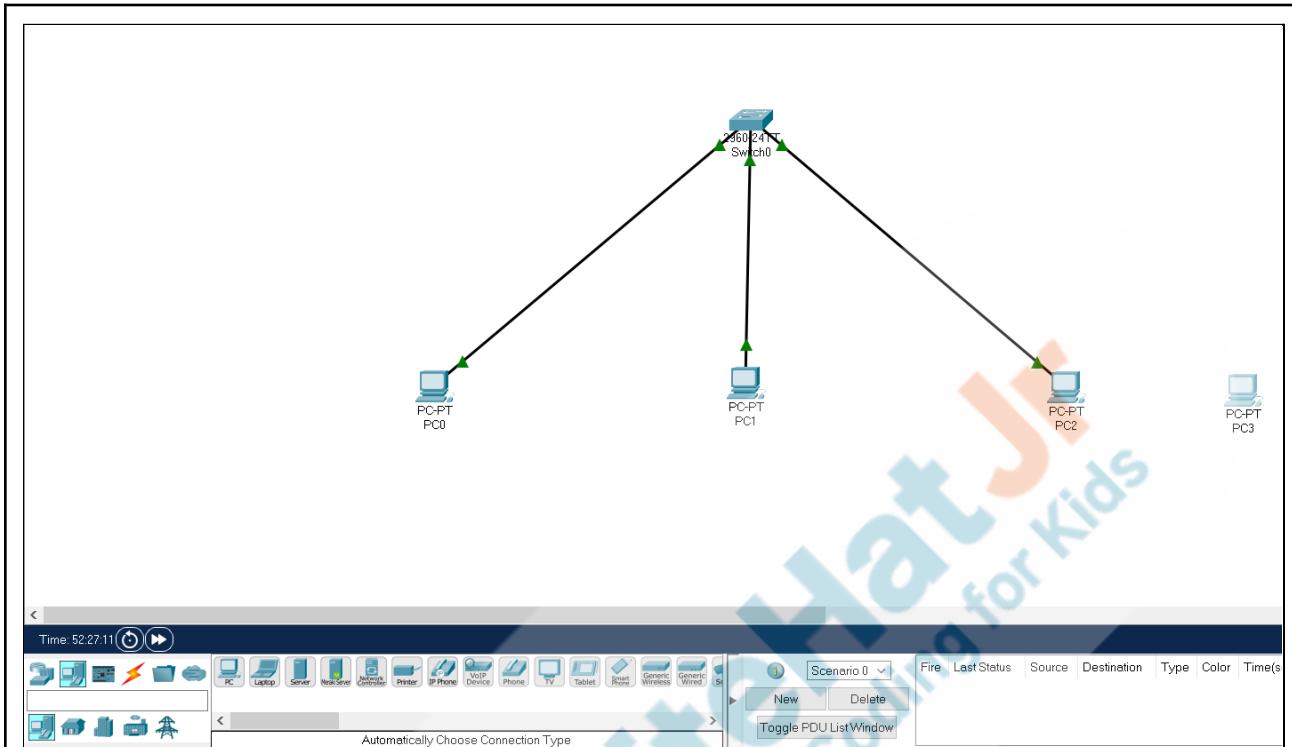
Reply from 10.0.0.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Very good!
Now we will add one more computer on our screen and connect that with the switch.
Do you know how to add a computer?

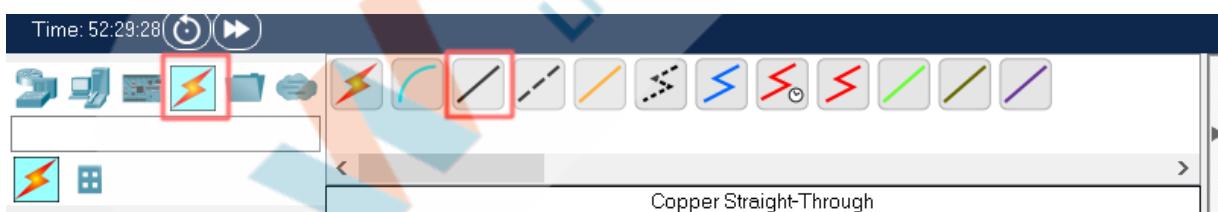
Great!
So let's bring the computer on the canvas.

ESR:
Select the computer from bottom and then drag and drop on the canvas.



To connect this with the switch we will not use the automatic connection we are going to choose the cable manually.

And the cable is called copper straight through cable.



Select the cable from the connections menu and then click on the computer.

This will give the options of the port where we want to connect this cable.

While creating the network we will always connect the cable with a fast ethernet port. Because this is the port reserved for networking.

On this computer it is FastEThernet0.

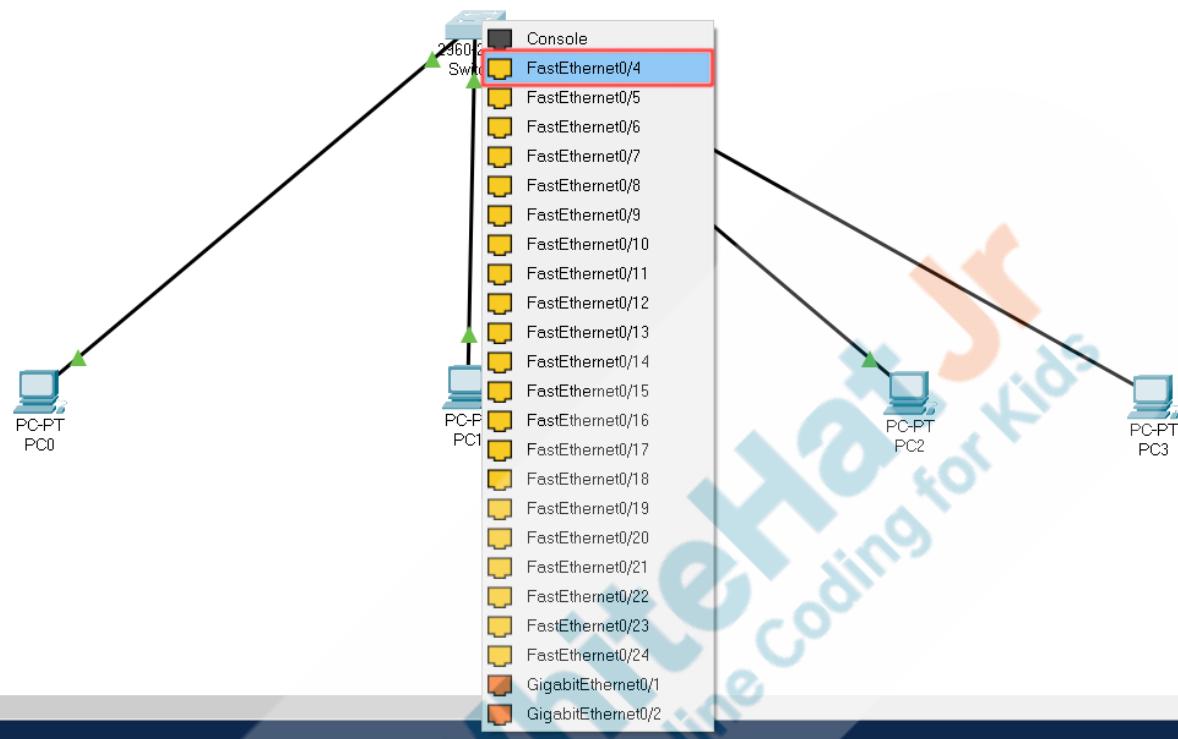
Select this option and then click on the switch.



Switch has many ethernet ports. To connect multiple computers.

When you click on the switch it shows the available port for the connection. First 3 ports are used by the first 3 computers.

So we will choose the FastEthernet port 4.

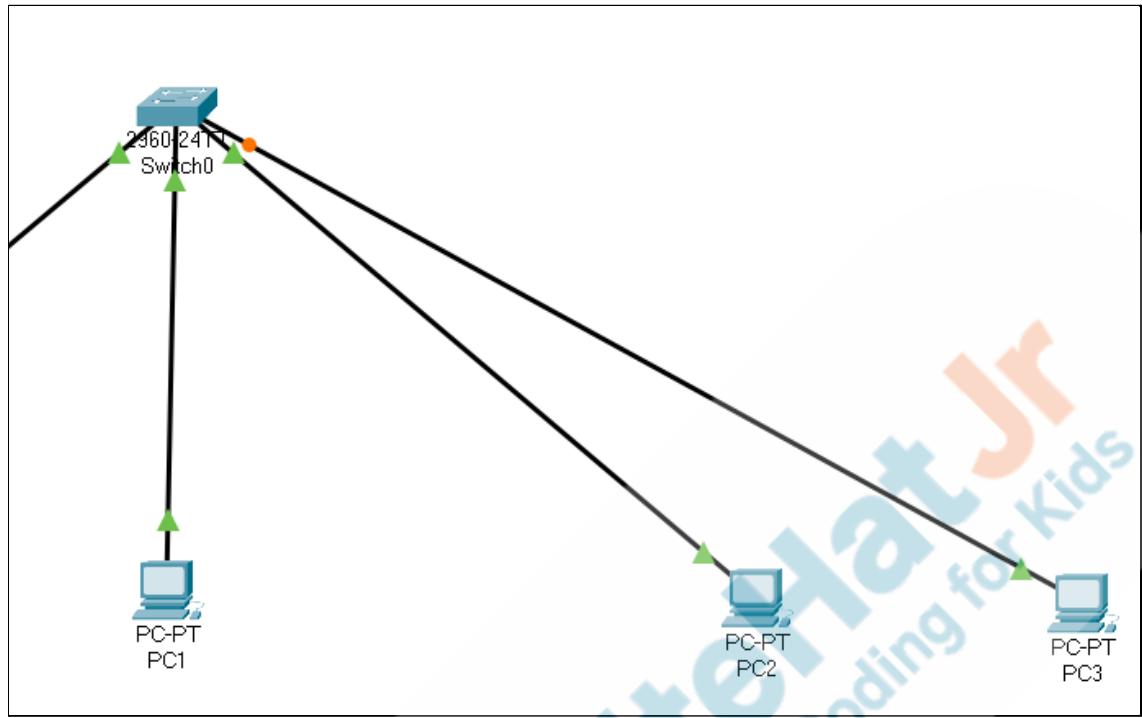


Now our connection with the switch is complete.
But there is something odd here.
Have you noticed it?

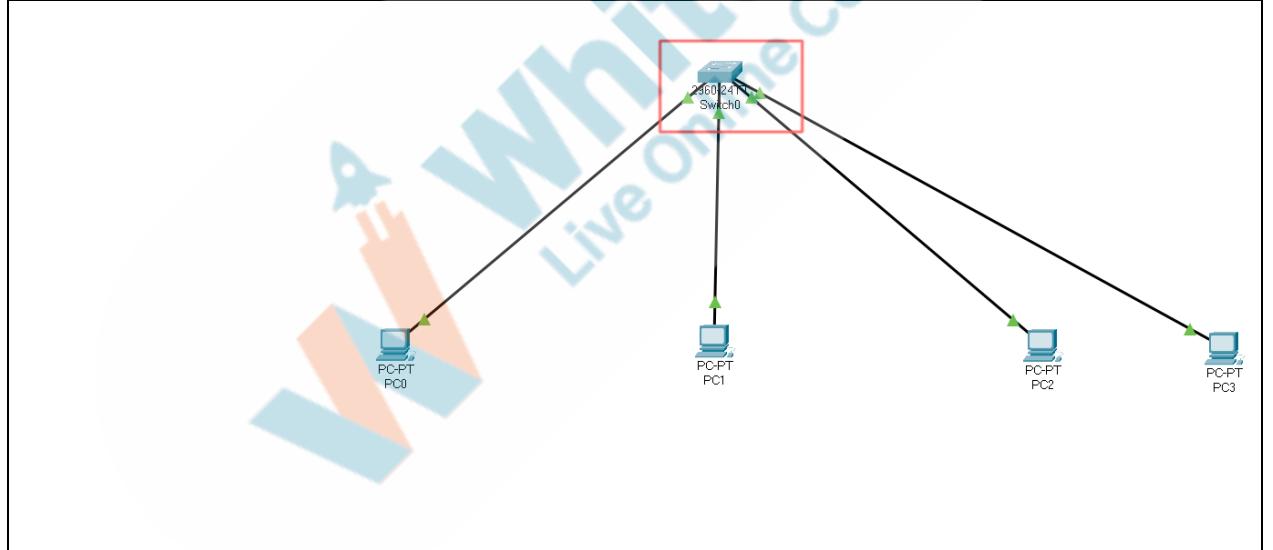
The connection with all the other computers is green. We have green triangles at both the ends.
But the computer we just connected to the switch has an orange circle near the switch.

This happens because the switch takes some time to set up and while it is showing an orange circle it means that the setup is not complete. Usually this turns into green in less than a minute. But since we are in a simulation we can make it fast. By clicking on the fast forward button.

ESR:
Varied



260|241
Switch0



260|241
Switch0

PC-PT
PC0

PC-PT
PC1

PC-PT
PC2

PC-PT
PC3



52:30:44 (C) 

Fast Forward Time (Alt+D)

Scenario 0

New Delete

Connection is done. Now assign the Ip address to this newly added computer as well.
You can assign 10.0.0.4 to this computer.

Once the IP address is assigned we are going to see what happens when we run the ping command and how the information is shared in the network. Now our network is in the realtime mode. Which means it acts like we are building a actuall network.

SO all the processes are happening in real time. But what if we want to see an operation in slow motion. We want to see step by step how a message is being sent from one computer to another computer.

For that we will enter the simulation mode of the software. At the bottom right corner of the Cisco packet Tracer. We have 2 options: realtime and Simulation. Click on the simulation button to set the Simulation mode.



Once in the simulation mode.

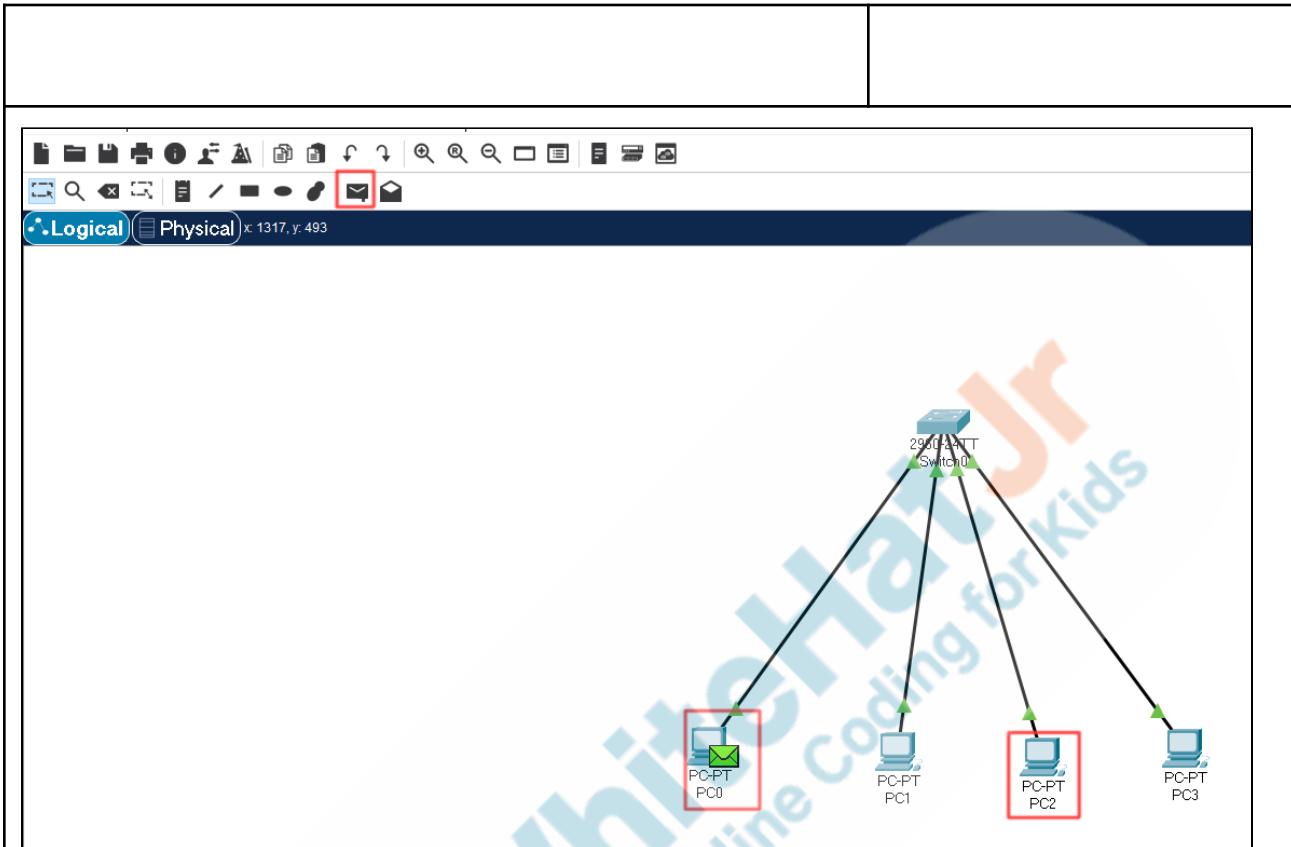
Select the packet and you can see there is an envelope icon on the cursor. This is a data packet.

Once you select the data packet then click on the first computer and then click on the 4th computer. What we are doing here is sending data from the first computer to the 4th one.

It is just like doing a ping.

Select the packet and then click on the first pc and then on the 3rd PC.

This will show a message icon on the first PC.



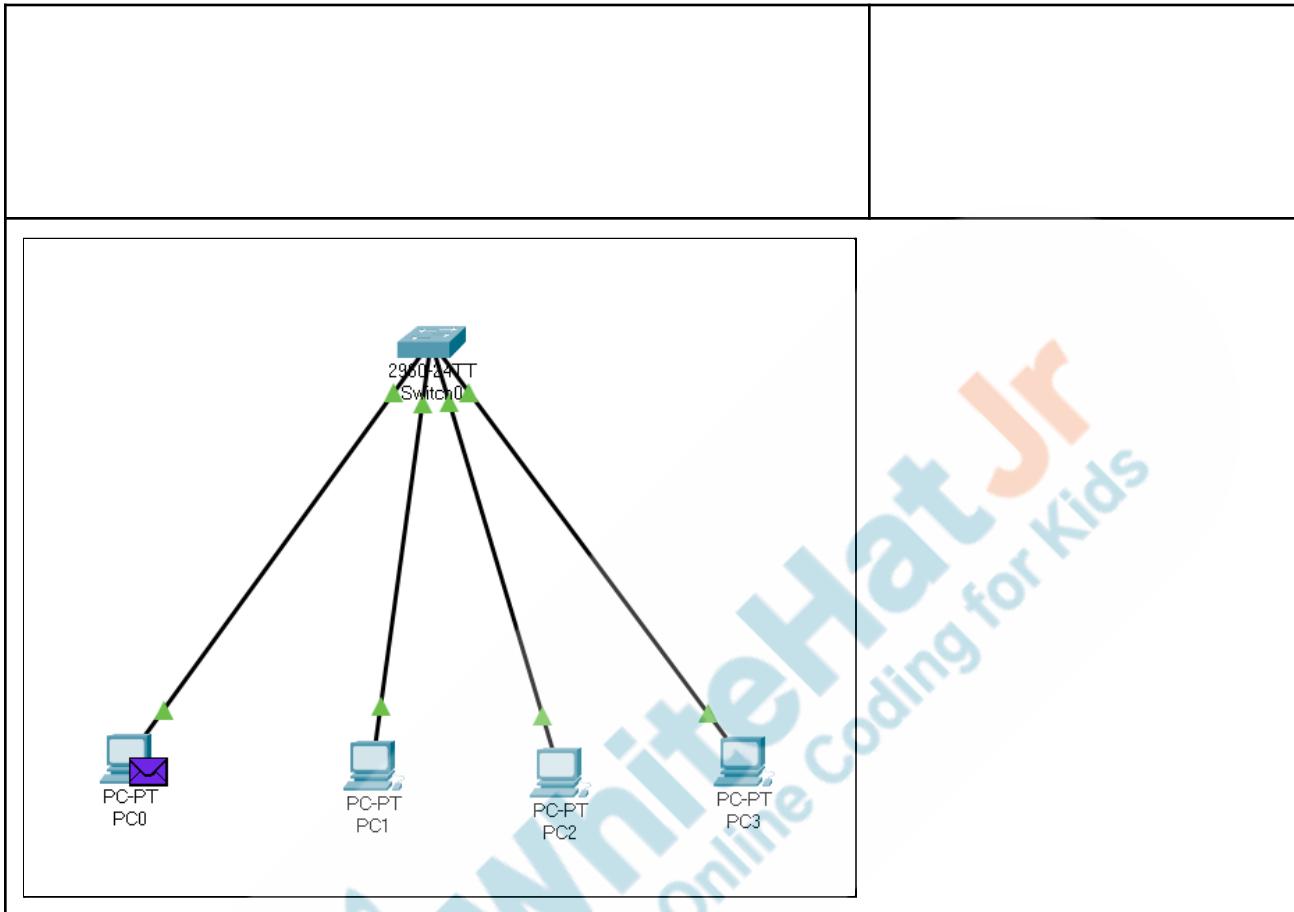
Now the packet is at the first PC, in order to move it forward we need to click on the forward button in the bottom menu.

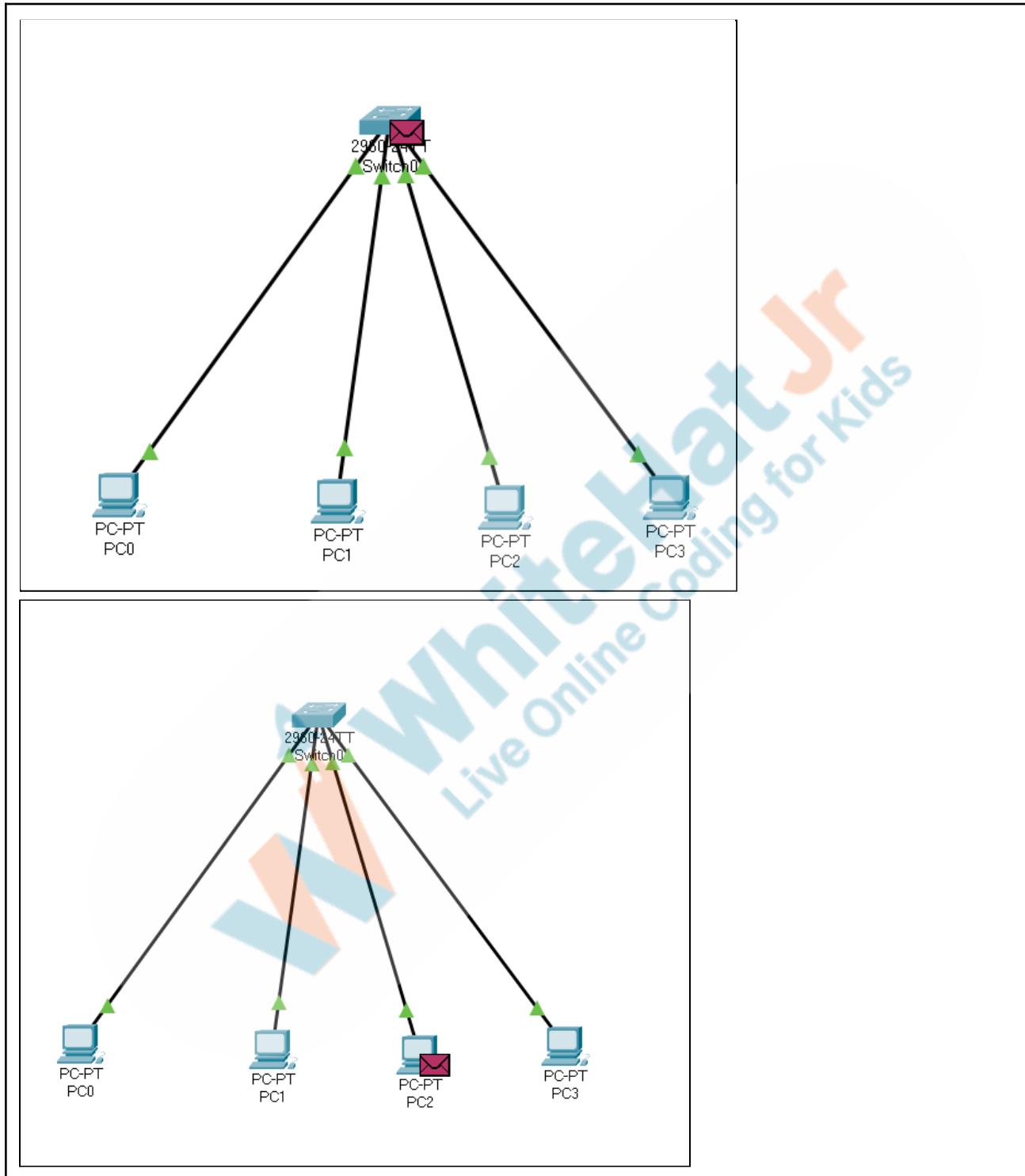
When you click on that button it will send the packet to the switch and to the packet forward you need to click that button again.

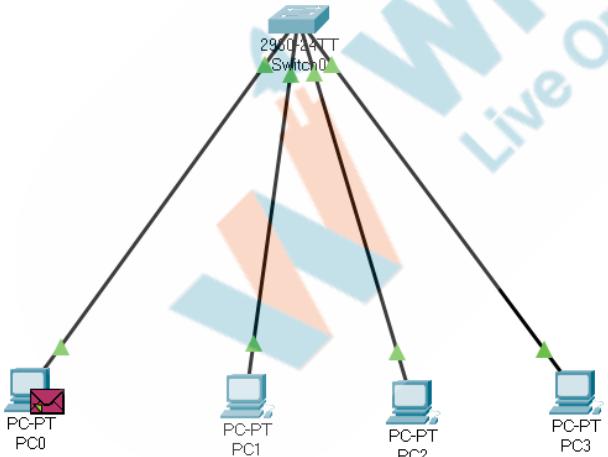
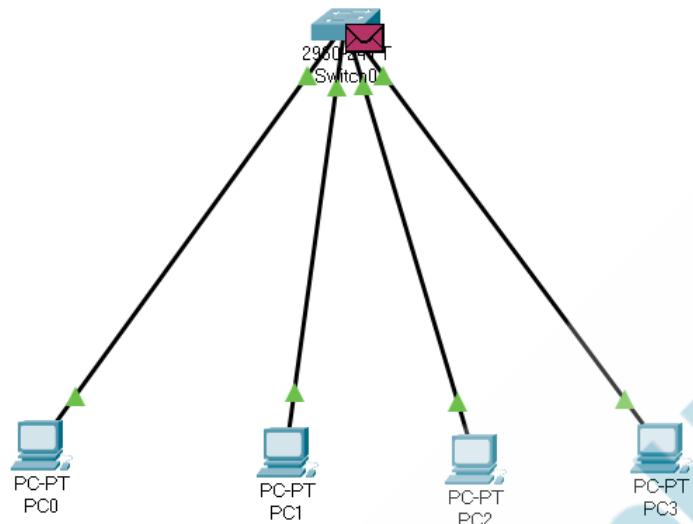
Which will send the packet to the target PC.



The path message takes is from the sender PC to switch then to the receiving PC from there comes back to the switch and then back to the sender PC.







This is the process of a ping.
 We learned about the switch that it is an intelligent networking device.
 It stores the Mac address of the computers connected with

it.

Which makes the routing of the data easy. There used to be a device named HUB. if you are sending the data from the computer to another computer via the hub.

It used to send that data to each and every computer.

Which is not an ideal scenario. Because we want to send data to only 1 computer.

That is where the switch comes into the picture. Switch stores the MAC address of the device and it sends the data to that device only.

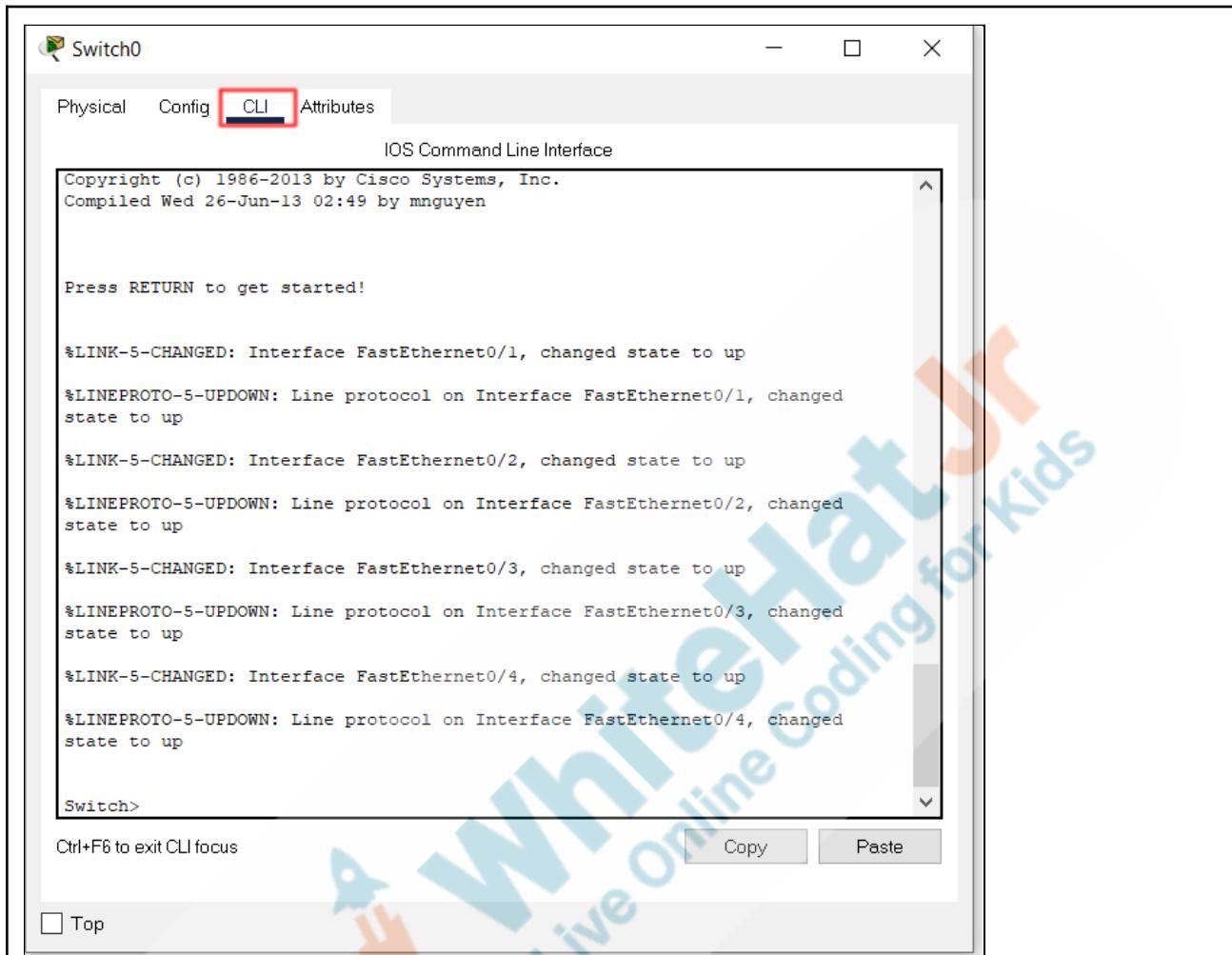
We can see the mac address stored in the switch by running a very simple command.

But first double click on the switch.

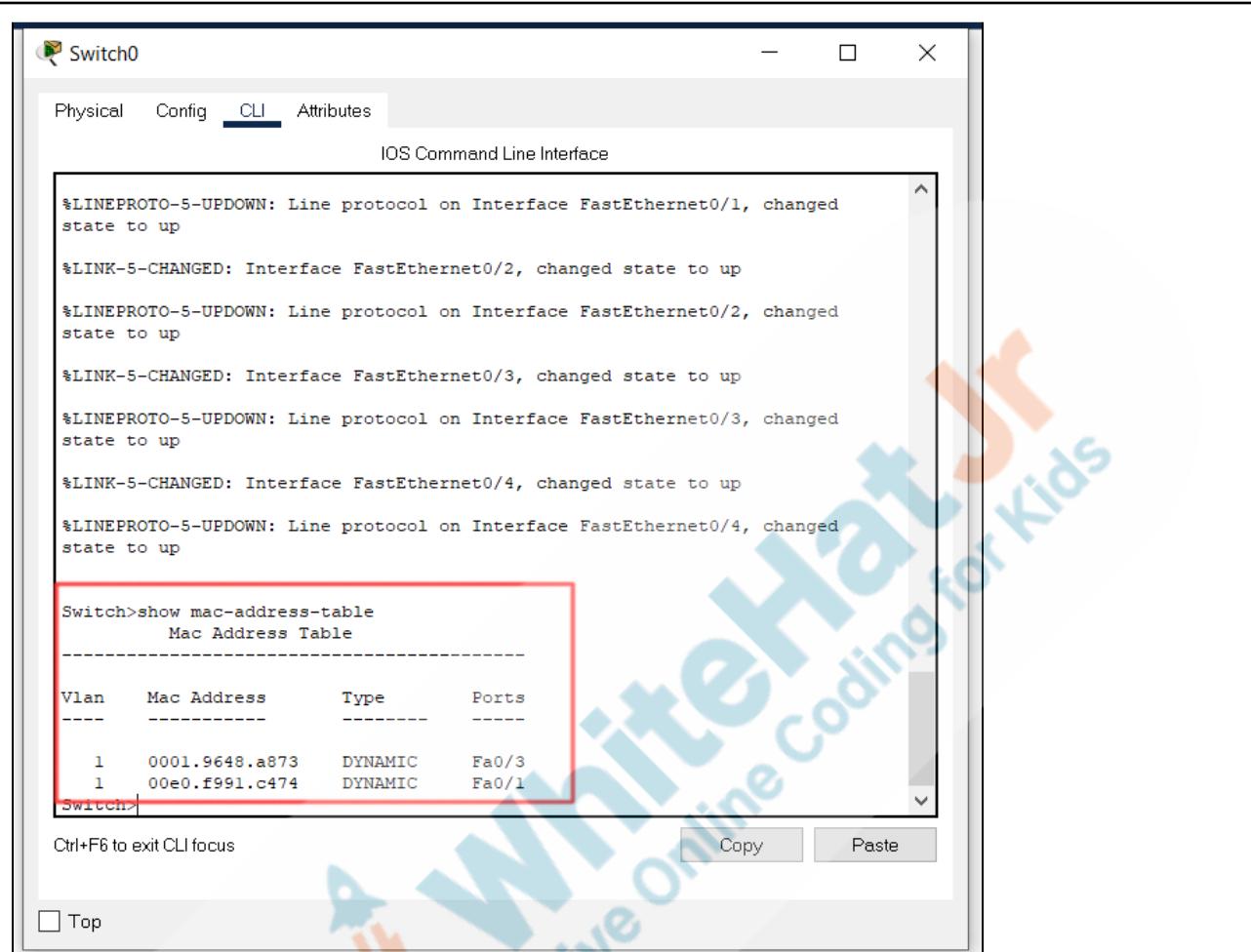
Then select the CLI option.

This stands for command line interface.

This is similar to the command prompt. We can run the commands here.



The command we are going to run is **show mac-address-table** this will show all the mac address stores in the switch. Type this command and press enter.



```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed state to up

Switch>show mac-address-table
      Mac Address Table
-----
Vlan   Mac Address        Type      Ports
----  -----
  1    0001.9648.a873  DYNAMIC   Fa0/3
  1    00e0.f991.c474  DYNAMIC   Fa0/1
Switch>
```

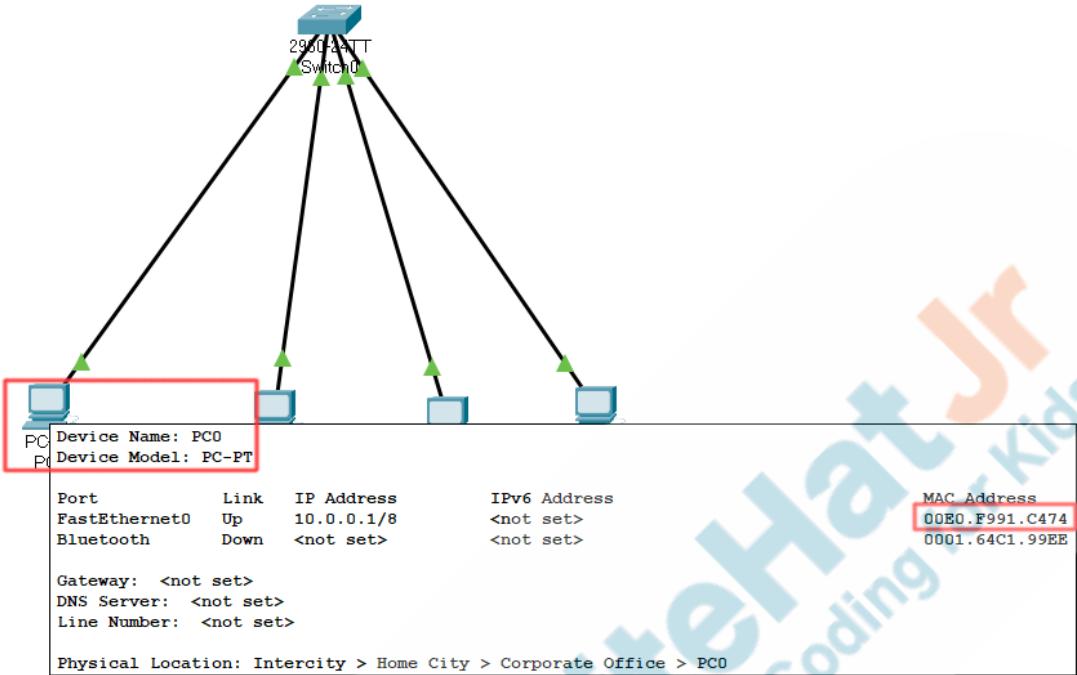
Ctrl+F6 to exit CLI focus

Top

This shows the mac address of the first and 3rd PC, because we did a ping between these two computers only. To register the Mac address in the switch we need to ping the device.

We can check whether these MAC addresses are correct or not by comparing them with the mac address of the first and 3rd PC.

Take the cursor on the PC and hold it there it will show the mac address.

 <table border="1" data-bbox="225 783 915 1036"> <tr> <td>PC</td><td>Device Name: PC0</td></tr> <tr> <td>PC</td><td>Device Model: PC-PT</td></tr> <tr> <td>Port</td><td>Link</td><td>IP Address</td><td>IPv6 Address</td></tr> <tr> <td>FastEthernet0</td><td>Up</td><td>10.0.0.1/8</td><td><not set></td></tr> <tr> <td>Bluetooth</td><td>Down</td><td><not set></td><td><not set></td></tr> <tr> <td colspan="4">Gateway: <not set></td></tr> <tr> <td colspan="4">DNS Server: <not set></td></tr> <tr> <td colspan="4">Line Number: <not set></td></tr> <tr> <td colspan="4">Physical Location: Intercity > Home City > Corporate Office > PC0</td></tr> </table>	PC	Device Name: PC0	PC	Device Model: PC-PT	Port	Link	IP Address	IPv6 Address	FastEthernet0	Up	10.0.0.1/8	<not set>	Bluetooth	Down	<not set>	<not set>	Gateway: <not set>				DNS Server: <not set>				Line Number: <not set>				Physical Location: Intercity > Home City > Corporate Office > PC0				
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<p>Here it shows the 2 mac addresses for each PC. That is because each networking device in the computer is assigned a mac address.</p> <p>So the first mac address is an ethernet device with which our computer is connected with a switch. The second mac address here is of the bluetooth device on the computer.</p> <p>When we checked the mac address of our computer we saw multiple mac addresses associated with different networking devices on our computer.</p>																																	
<p>In this class we have seen how to run different networking commands on the our commands prompt and terminal. We learned how to make a LAN using a switch.</p> <p>Here we are still working on a Local Area Network. In the next class we are going to learn how to connect two LANs using a device called router.</p>																																	

Teacher Guides Student to Stop Screen Share	
WRAP UP SESSION - 5 Mins	
● Teacher starts slideshow from slide 19 to slide 30.	
Activity details	Solution/Guidelines
Run the presentation from slide to slide Following are the warm up session deliverables: <ul style="list-style-type: none"> • Explain the facts and trivias • Next class challenge • Project for the day • Additional Activity 	Guide the student to develop the project and share with us
Quiz time - Click on in-class quiz	
Question	Answer
Which of the following command clears the cmd? A. clear B. cls C. clearscreen D. clearcmd	B.
Which of the following is correct? A. The IP address doesn't change with network but the user can set the IP address on its own. B. The IP address gets changed when we change the network but the user cannot set the IP address on its own. C. The IP address gets changed when we change the network and the user can set the IP address on its own. D. The IP address doesn't change when we change the network and the user can never set the IP address on its own.	C.

<p>_____ stores the MAC address of the device and it sends the data to that device only.</p> <p>A. Switch B. Router C. Hub D. Hard-disk</p>	A.
End the quiz panel	
<u>FEEDBACK</u>	
<ul style="list-style-type: none"> • Appreciate the student for their efforts in the class. • Ask the student to make notes for the reflection journal along with the code they wrote in today's class. 	
<p>You get Hats Off for your excellent work!</p> <p>Awesome!</p>	<p><i>Make sure you have given at least 2 Hats Off during the class for:</i></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Creatively Solved Activities +10</p> </div> <div style="text-align: center;">  <p>Great Question +10</p> </div> <div style="text-align: center;">  <p>Strong Concentration +10</p> </div> </div>
<p>Project Overview</p> <p>IP Finder</p> <p>Goal of the Project:</p> <p>In Class 194 , we learned how to find the IP address of any website using the nslookup command. In this project</p>	

we are going to find the IP address of a few websites and also find the mac address of your computer.

Story:

The Internet is a network of billions of computers. All the data related to the websites is also stored on a computer called a server. Each website is assigned an IP address. Working as a networking admin you want to find the IP addresses of a few websites.

I am very excited to see your project solution.



Teacher ends slideshow

 End Class

Teacher Clicks

Additional Activities

Encourage the student to write reflection notes in their reflection journal using markdown.

Use these as guiding questions:

- What happened today?
 - Describe what happened.
 - The code I wrote.
- How did I feel after the class?
- What have I learned about programming and developing games?
- What aspects of the class helped me? What did I find difficult?

The student uses the markdown editor to write her/his reflections in the reflection journal.

Activity Name	Description	Link
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Student Activity 1	Template	https://drive.google.com/file/d/1uVBwS024PsLDR35NDbWtFr8HzmMOrCy/view?usp=sharing
Student Activity 1	Solution	https://drive.google.com/file/d/1RZKYc5RHtvEKn8kIIBMGs1vfHZqjOSG/view?usp=sharing
Teacher Reference visual aid link	Visual aid link	https://curriculum.whitehatjr.com/Visual+Project+Asset/PRO_VD/PRO+V3-C194-withcues.html
Teacher Reference In-class quiz	In-class quiz	https://s3-whjr-curriculum-uploads.whjr.online/a14f005c-2391-4b7a-8550-afaf6f54fb4e.pdf