Topic	TOPOLOGIES	
Class Description	Students will learn about different types of connections between the computers. Students will also learn about topologies and to create the topologies.	
Class	**196**	
Class time	**45 mins**	
Goal	● To Learn about the topologies. ● Create different topologies.	
Resources Required	● Teacher Resources: ○ Laptop with internet connectivity ○ Cisco Packet Tracer ○ Earphones with mic ○ Notebook and pen ○ Smartphone ● Student Resources: ○ 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 - 5 mins		

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Teacher starts slideshow from slides 1 to 11 Refer to speaker notes and follow the instructions on each slide.	
Activity details	**Solution/Guidelines**
Hi, how have you been? Are you excited to learn something new? ***Run the presentation from slide 1 to slide 3.*** **The following are the warm-up session deliverables:** ● Reconnect with previous class topics. ● Warm-Up quiz session.	**ESR**: Varied Response. Click on the slide show tab and present the slides.
QnA Session	
Question	**Answer**
Q. What command is used to check the IP Address of a computer? a) ipConfig b) ip.Config c) ipconfig d) None of the above	**C**
Q. What is the full form of WAN? a) Wide Automatic Network b) Wide Area Network c) With Area Network d) With Automatic Network	**C**
Continue the warm-up session	

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Activity details	Solution/Guidelines
Run the presentation from slide 4 to slide 11 to set the problem statement. **The following are the warm-up session deliverables:** • **Review code from the last class.**	
Teacher ends slideshow	
TEACHER-LED ACTIVITY - 10mins	
Teacher Initiates Screen Share	
ACTIVITY • **Learn about different topologies.** • **Create bus and star topology.**	
Teacher starts slideshow **for slide 12 and slide 19.**	
Teacher Action	**Student Action**
In the last class, we got started with Cisco packet Tracer and we also learned about creating a LAN. In this class we are going to explore a few more local area networks to create topologies. Network topology is the arrangement of the elements of a communication network. Network topology can be used to define or describe the arrangement of various types of telecommunication networks, including command and control radio networks, industrial field busses and computer networks.	

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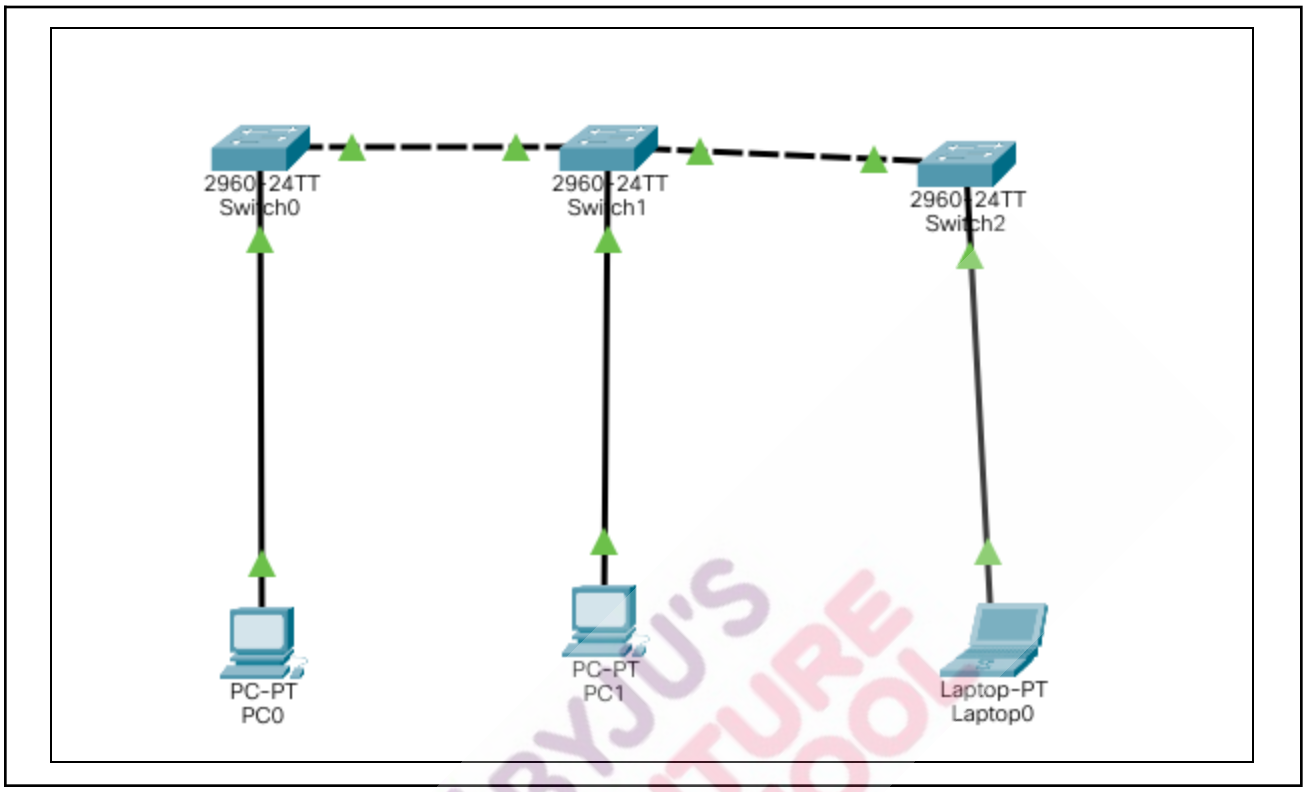

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This is one type of topology called a **bus** topology.
The bus topology is designed in such a way that it connects all the stations/switches through a single cable which is also called the backbone cable.

As we see here each node is either connected to the backbone cable by another drop cable or directly connected to the backbone cable.

In this topology when a node/PC wants to send the message over the network, it puts a message over the network and all the stations available in the network will receive the message whether it has been addressed or not as the backbone cable is considered as a “single lane” through which the message is broadcast to all the stations.

Each topology has it’s advantages and disadvantages.

The advantages are:-

- **Low-cost cable:** In bus topology, nodes are directly connected to the cable without passing through a hub. Therefore, the initial cost of installation is low.
- **Moderate data speeds:** Coaxial or twisted pair cables are mainly used in bus-based networks that support upto 10 Mbps.
- **Familiar technology:** Bus topology is a familiar technology as the installation and troubleshooting techniques are well known, and hardware components are easily available.
- **Limited failure:** A failure in one node will not have any effect on other nodes.

The disadvantages are:-

- **Extensive cabling:** A bus topology is quite simpler, but still it requires a lot of cabling.

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• **Difficult troubleshooting:** It requires specialized test equipment to determine the cable faults. If any fault occurs in the cable, then it would disrupt the communication for all the nodes. • **Signal interference:** If two nodes send the messages simultaneously, then the signals of both the nodes collide with each other. • **Reconfiguration is difficult:** Adding new devices to the network would slow down the network. • **Attenuation:** Attenuation is a loss of signal that leads to communication issues. Repeaters are used to regenerate the signal.	
Alright now let's see how to create this topology. First we'll open the cisco packet tracer. So as we know that in bus topology all the nodes are connected by one single cable which is called the backbone cable. To create this topology we'll be needing couple of devices which are :- 1. Switch, which will act as the nodes. 2. Computers or laptops, which will be connected to these nodes. 3. Wires to create the connections.	
Let's create the bus topology using 3 switches. Click on the switches option on the Cisco Packet Tracer. And select any of the switches from the right panel. We'll be using the 2960 switch.	
Click on switch option	

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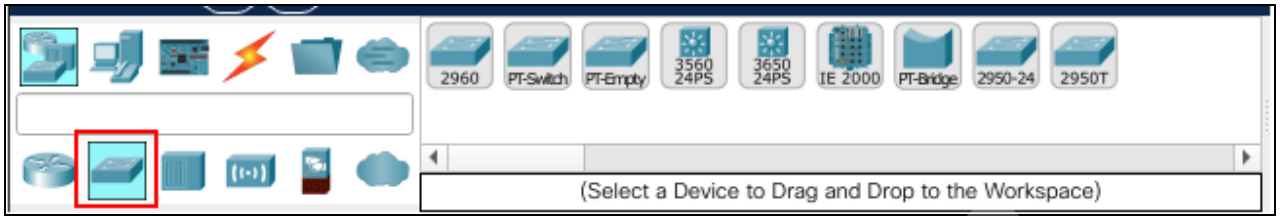
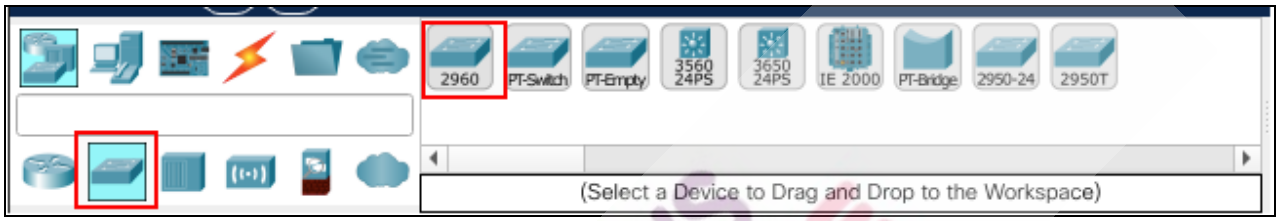


Select any of the switches from the panel.



Get the switches on the canvas.

Now what do we need to do? Yes! We need to join these switches using the cable. On the panel below we see the thunderbolt icon. When we press it we see different types of the cables. If we again click on the thunderbolt icon on the right panel and then click on the two switches it will select the correct cable automatically for us.	**ESR:** We need to join these switches using the cable.

Click on the thunderbolt icon.

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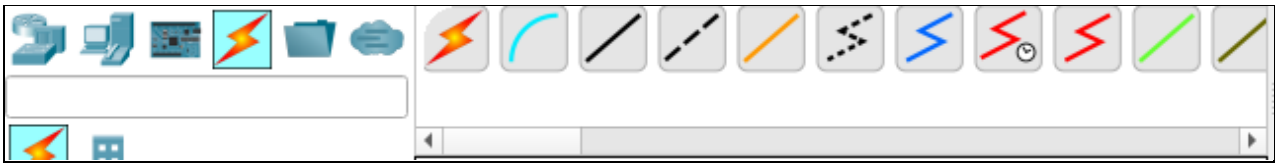
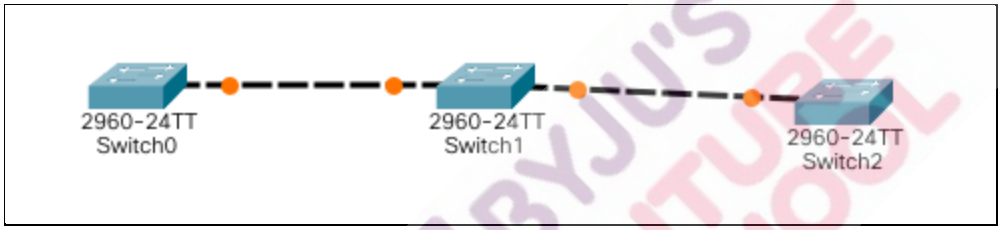
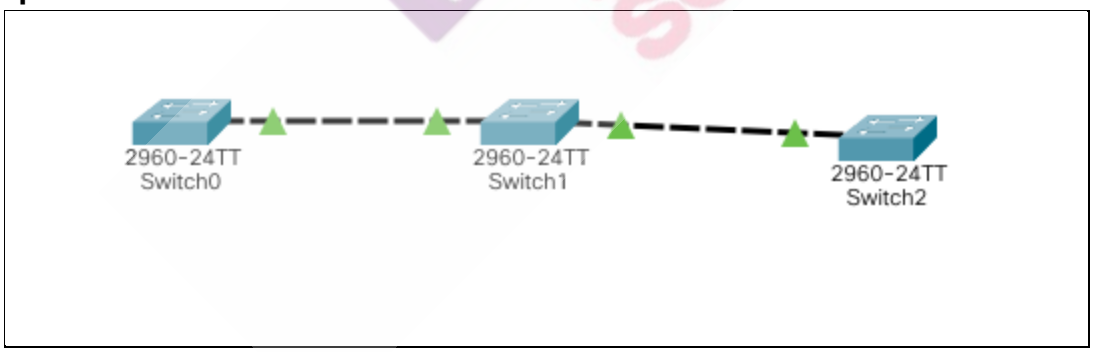


Click on the thunderbolt icon on the right panel and it will turn to block icon.

Join the switches with the cable.



Wait till the connection becomes green or click the fast forward button to speed up the connection.



What do we need to do next?	**ESR:** We need computer or laptop devices to send and receive packets.

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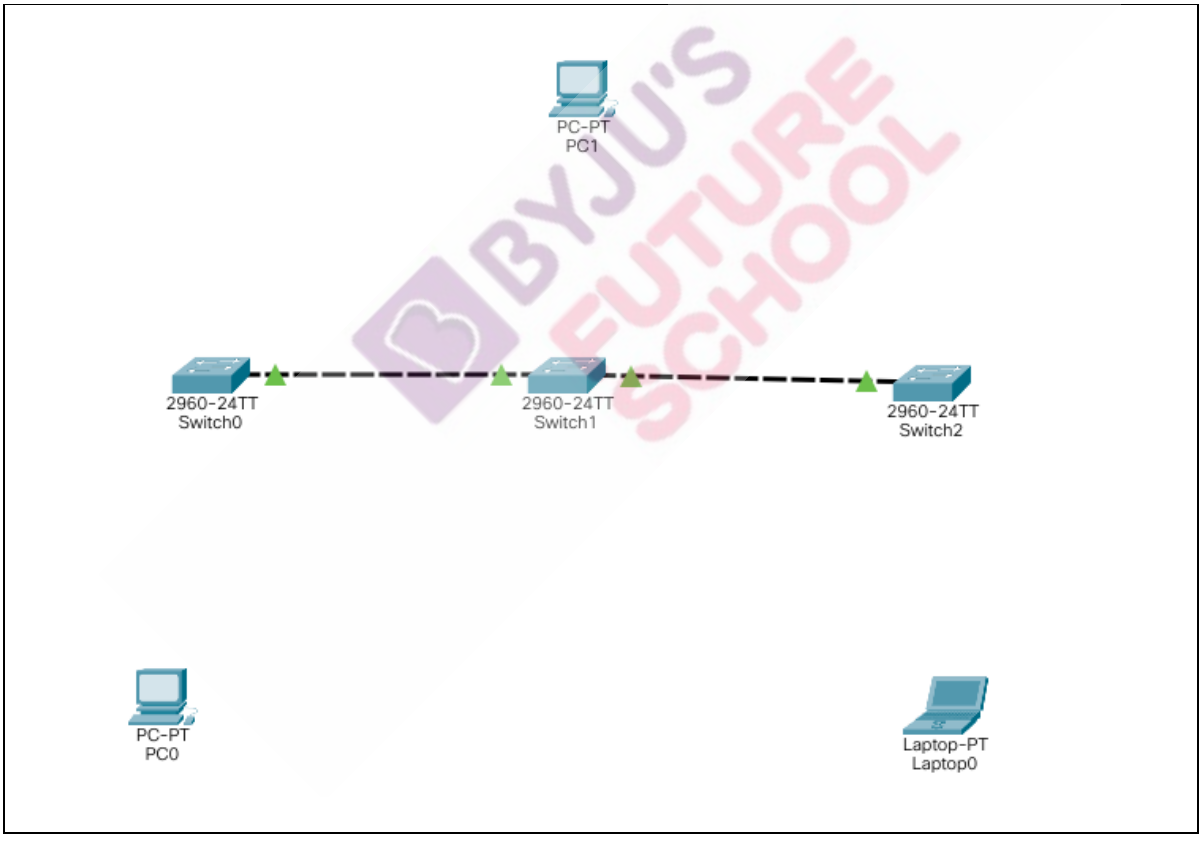
Yes! We need the devices to send or receive the packets. Let's add the devices to the canvas and connect them with the switches.	

Click on the End devices option.

A panel of devices opens up. Select PC or laptop and add it to the canvas.



Connect on the devices using the wires.

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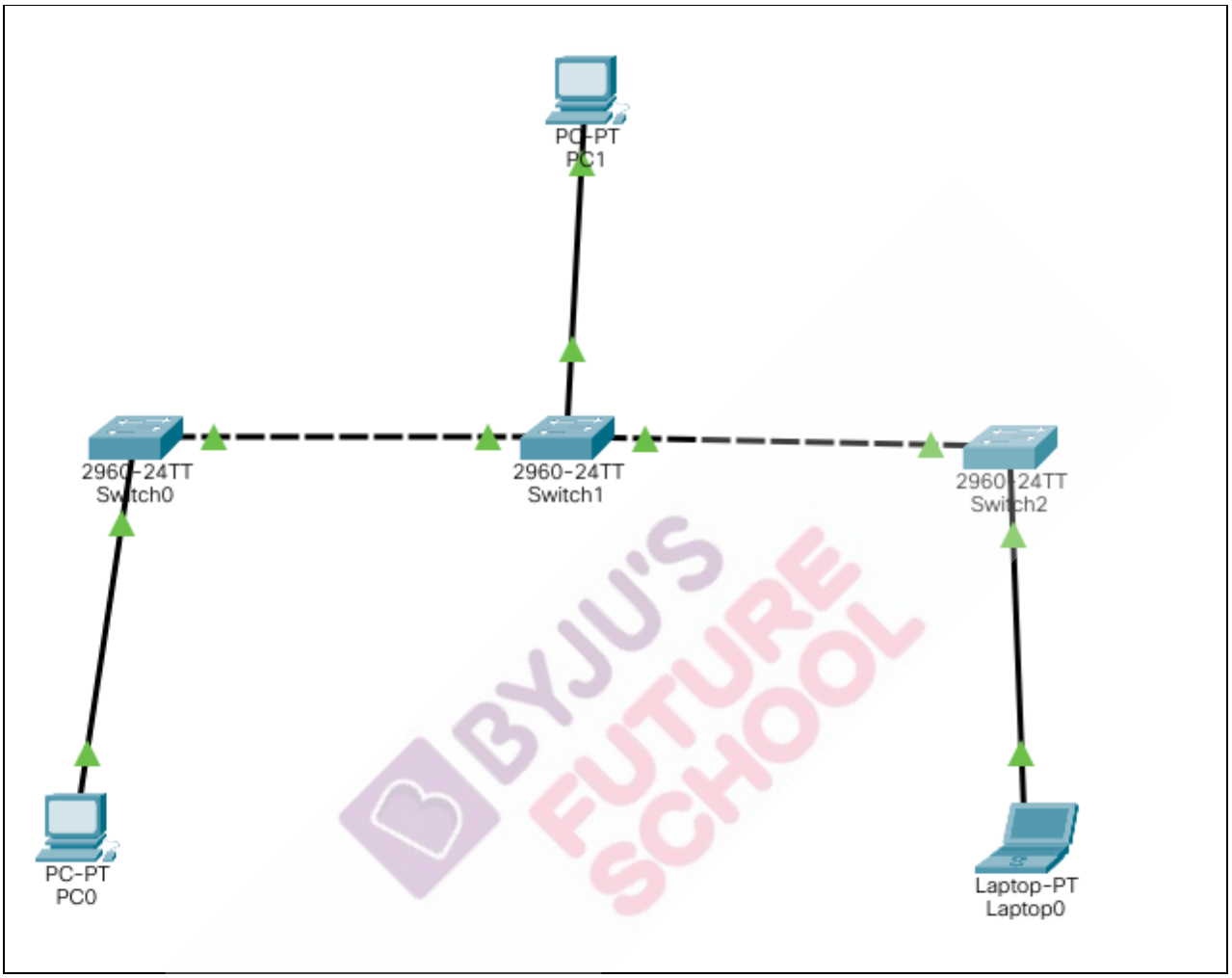

Even if we send the data from one PC to another it will fail. Can you tell why?

Yes! So let's add the IP address for each of the end devices.

To do so we'll:-

1. Click on one of the devices .
2. Click on Desktop.
3. Click on IP configuration.
4. Set the IP and the subnet mask.

ESR:

It will fail because we haven't specified the IP for any of the end devices.

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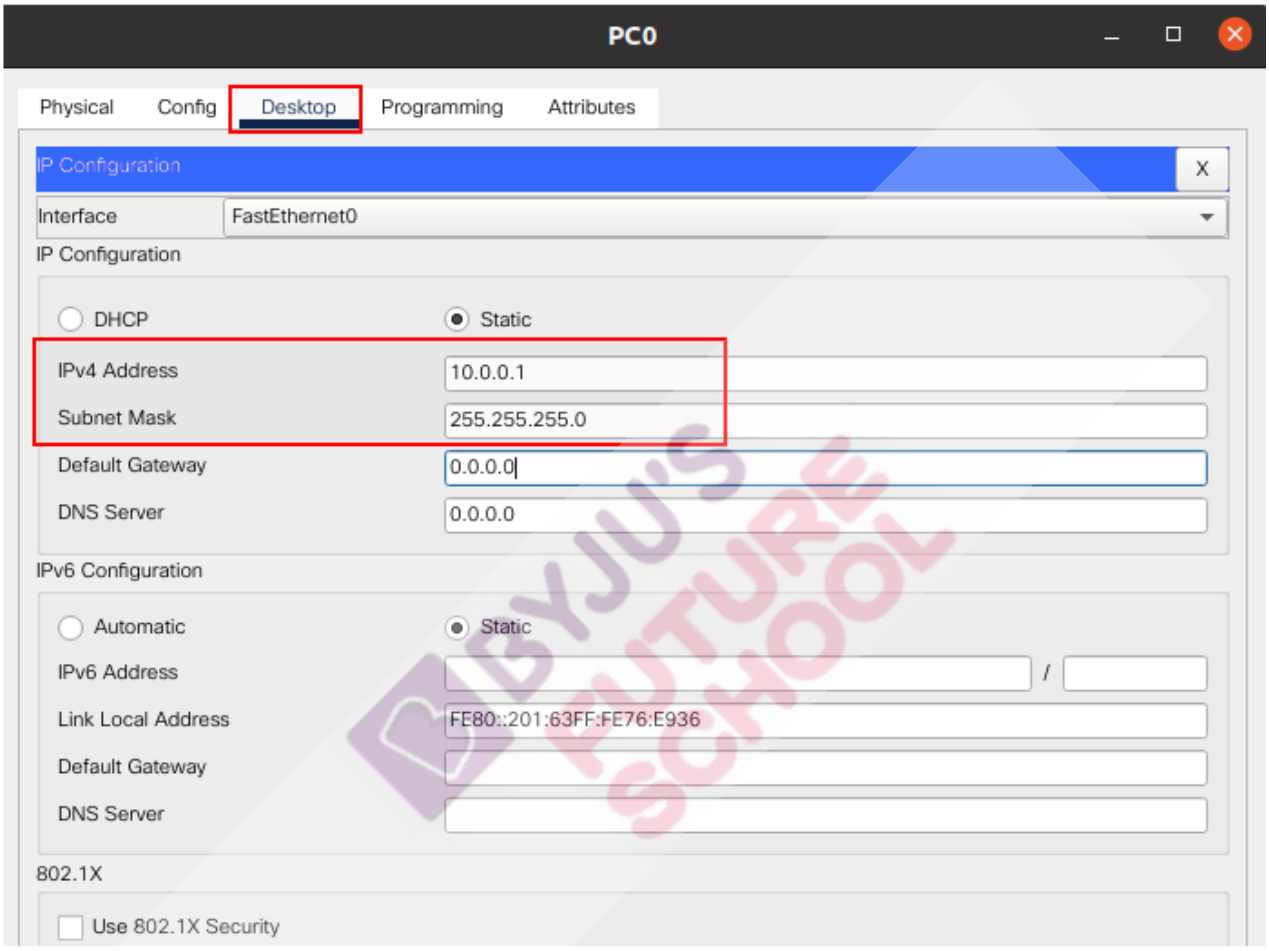
Set the IP for PC 0.



Similarly set the IP for other devices.

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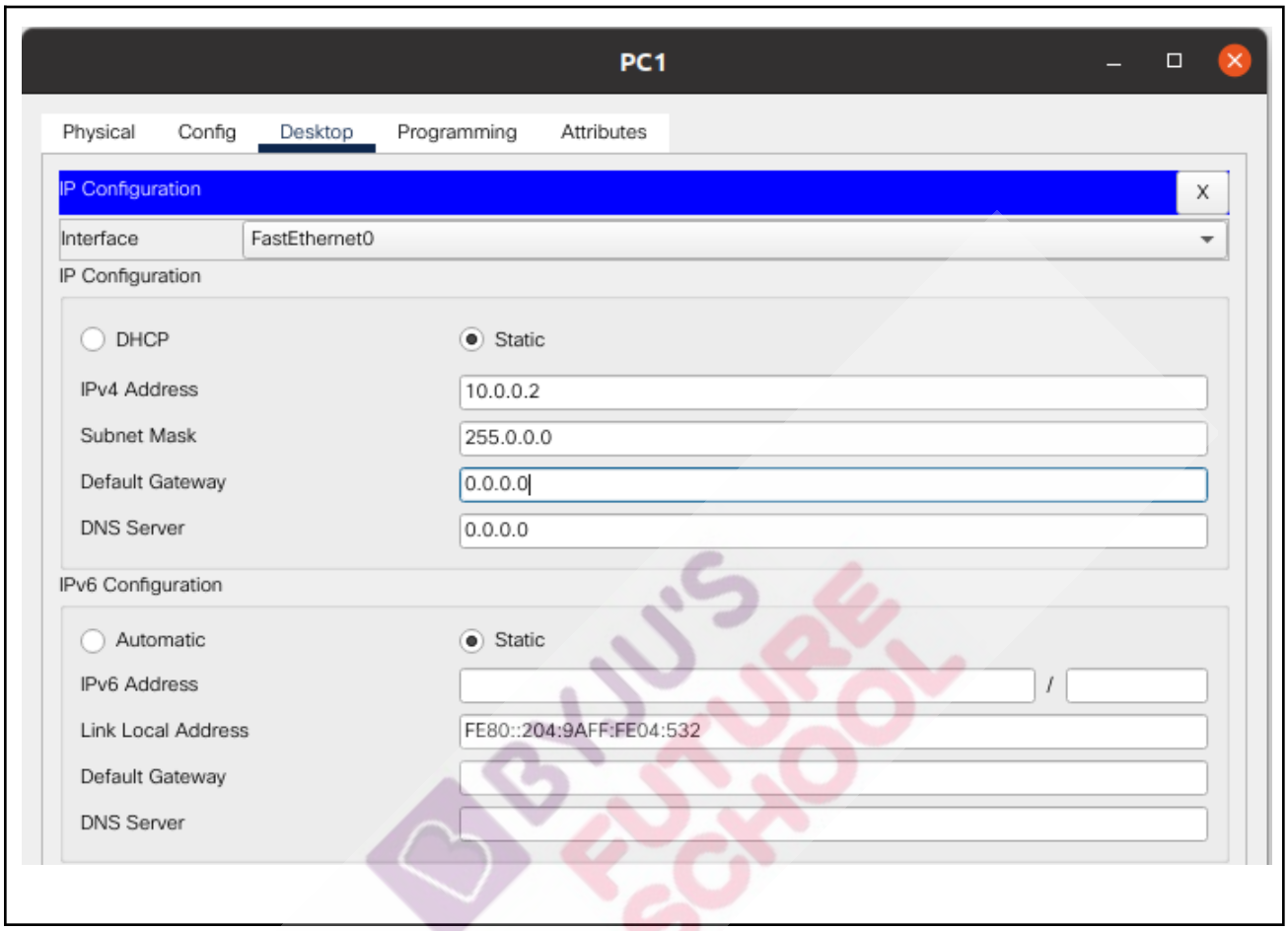

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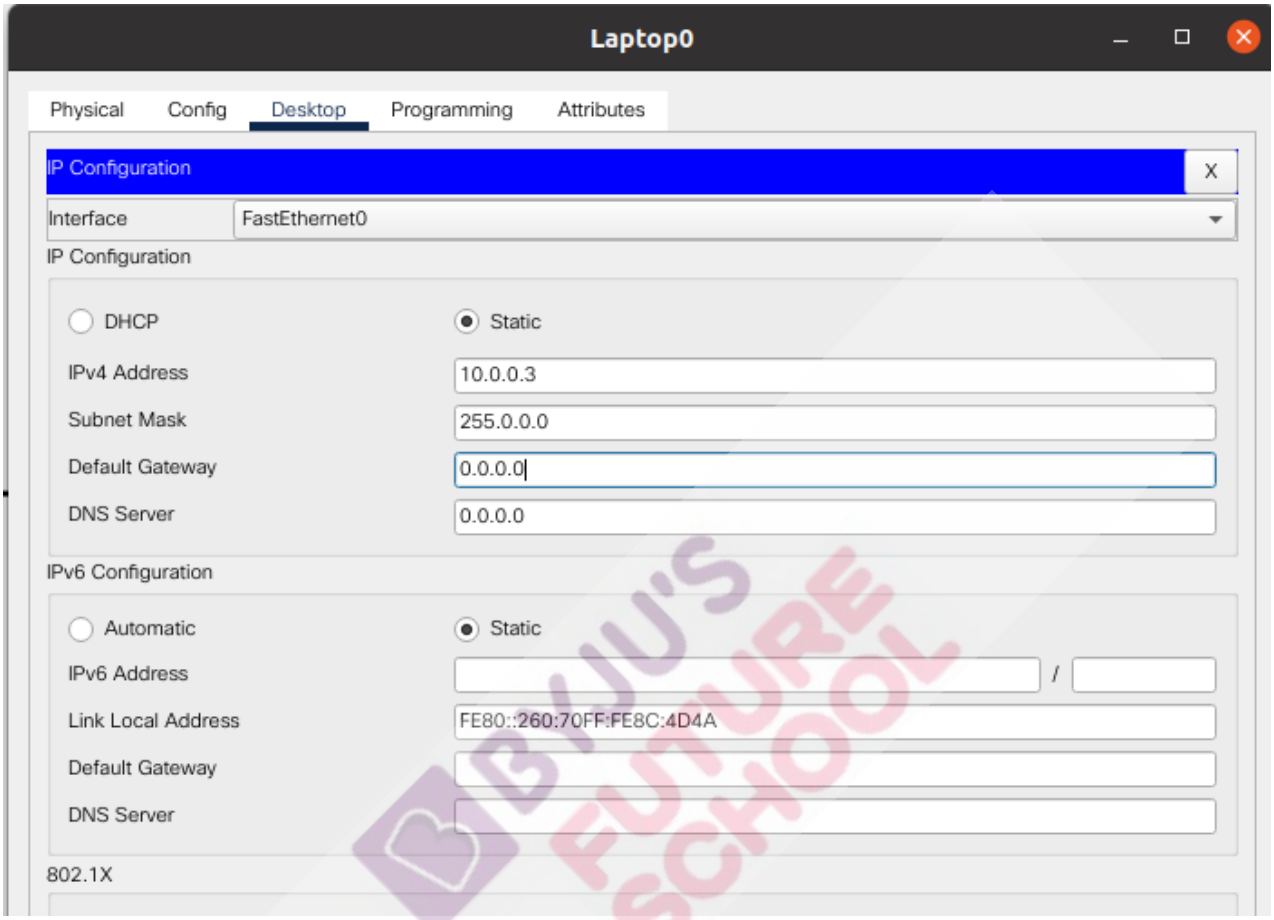

Now let's test the topology by sending some packets from PC0 to Laptop0.

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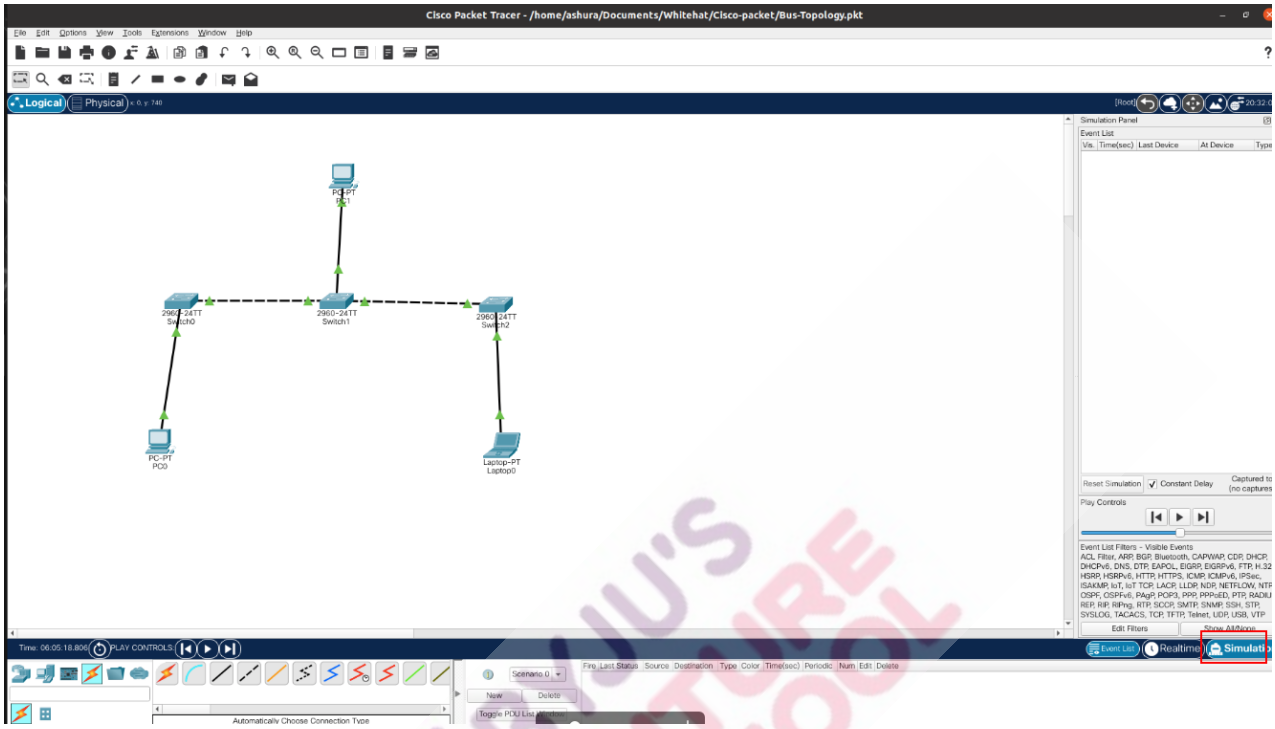
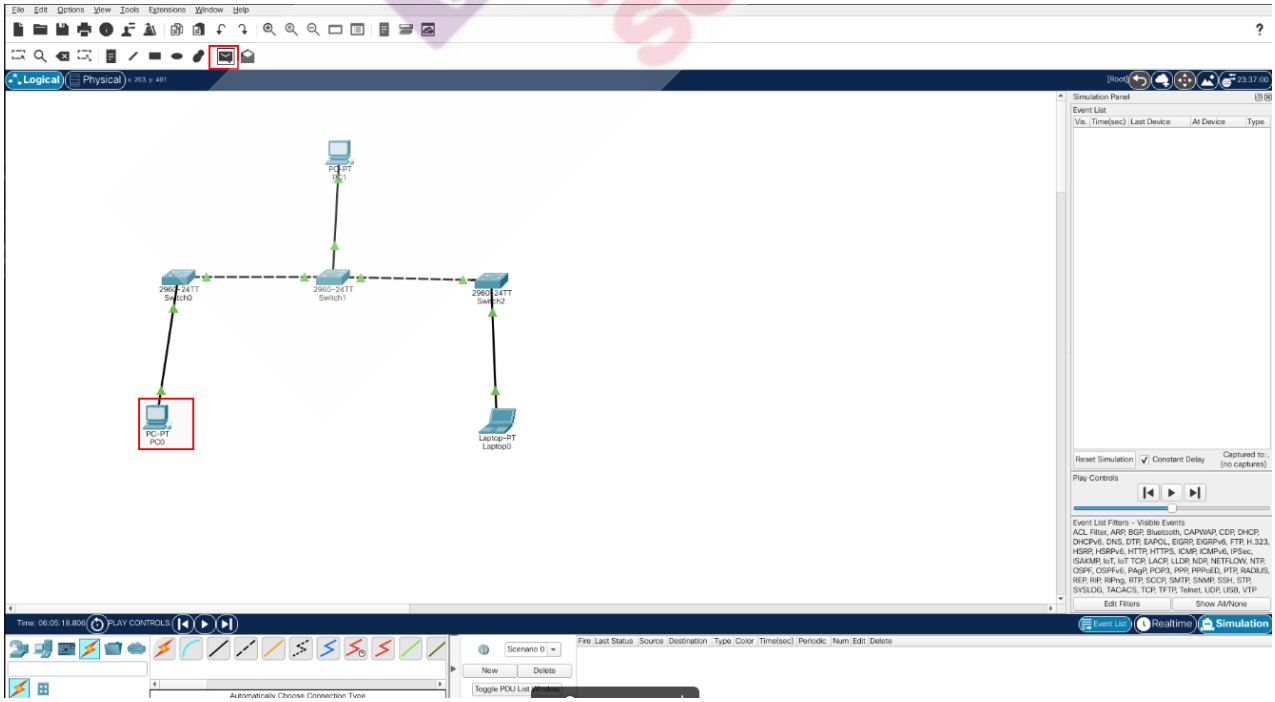
Click on the simulation option to see the whole process.



Click on the envelope icon and then click on one of the pc from where you want to send the packet



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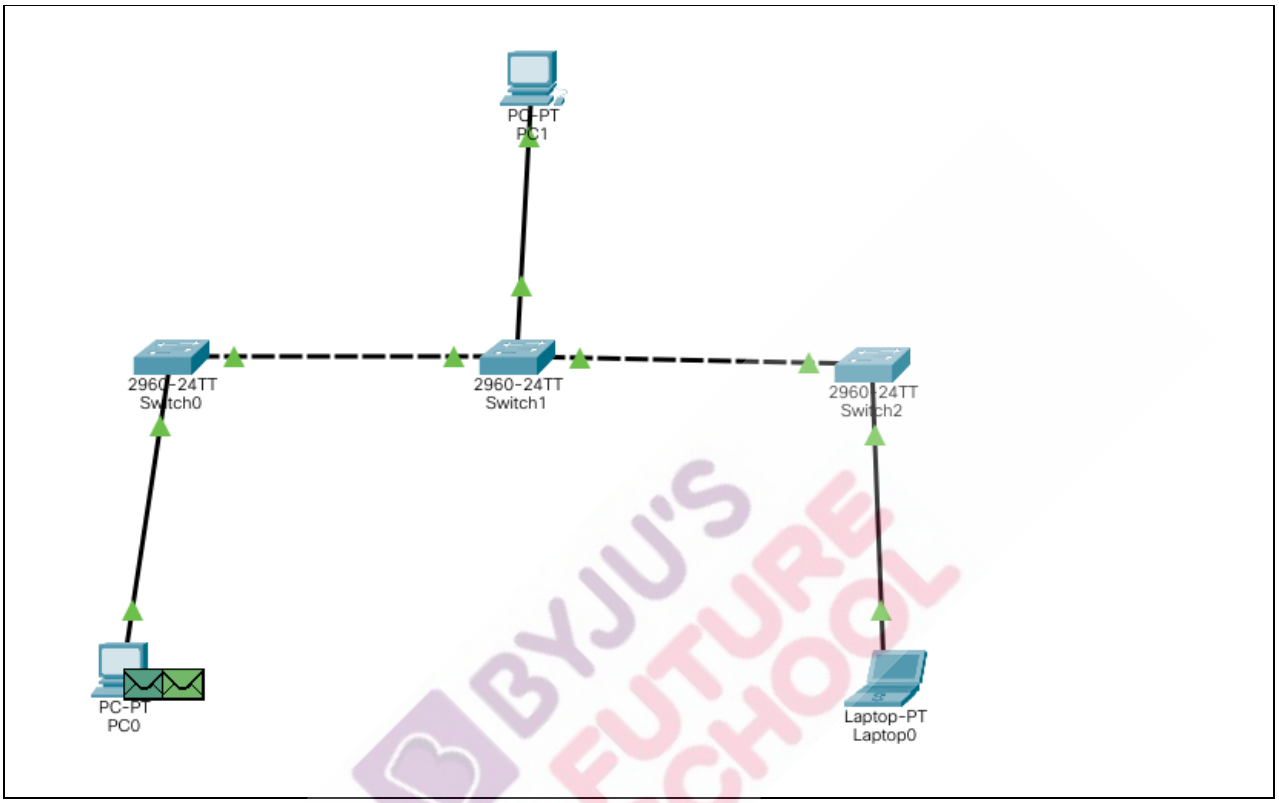
Then click on the other PC which you want to receive these packets.



Now to see the whole steps in the simulation we just need to click on the next button.

Click the next button to see the transfer of packets.

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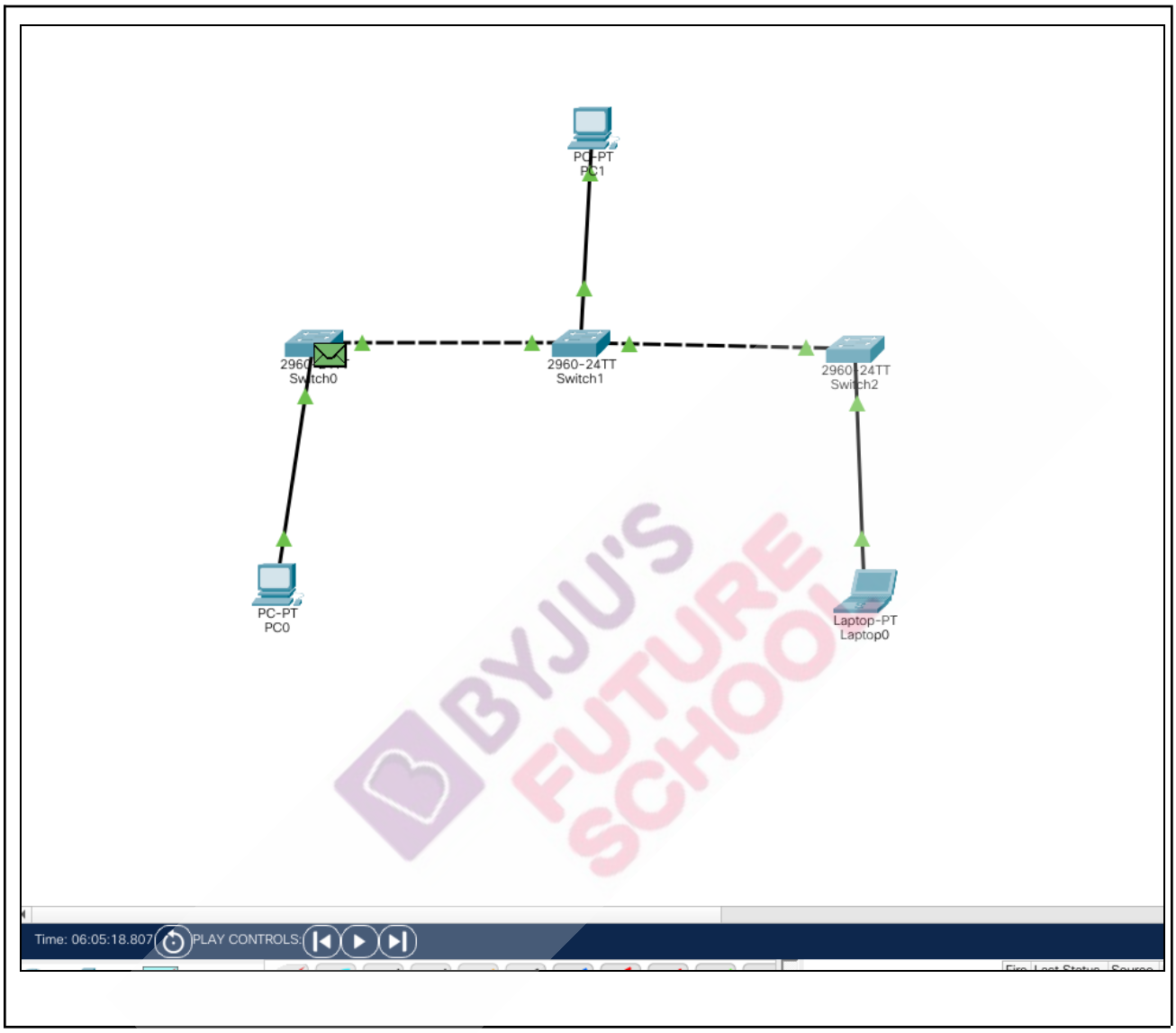

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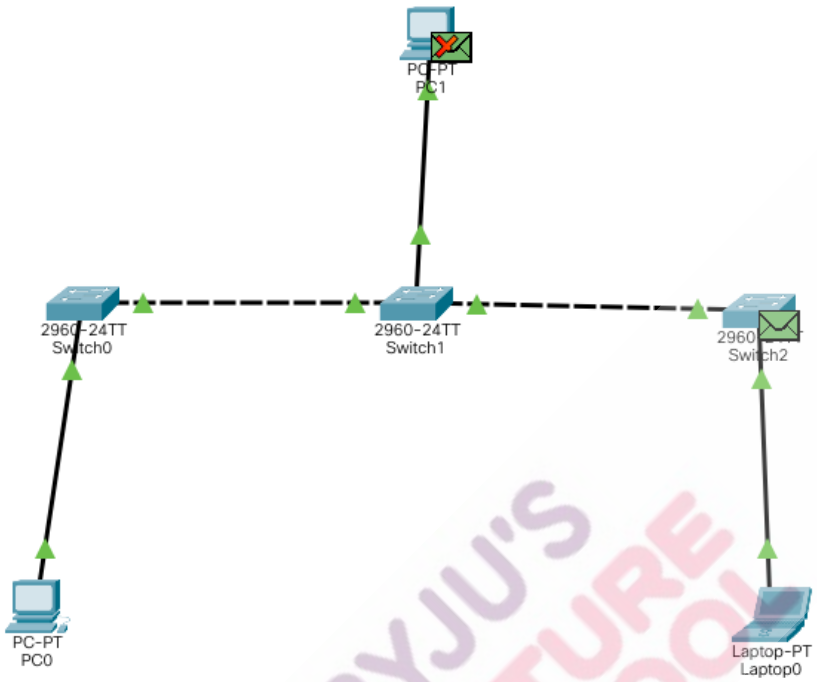

Packet also got sent to the device which we didn't want.

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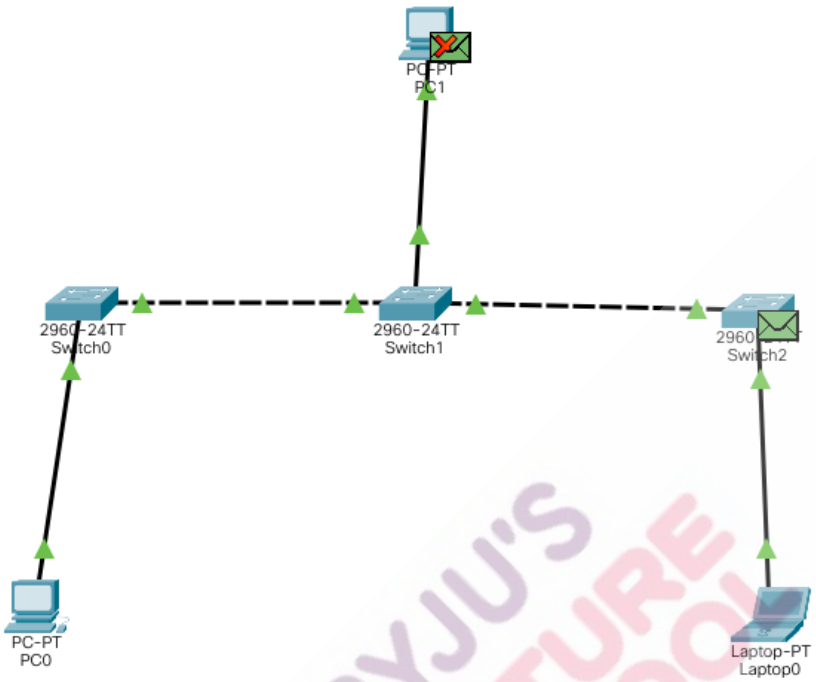

What can you see in the simulation? As we have studied earlier about the bus topology that it broadcasts the packets to all the connected devices. So the packets got sent to PC1 even when it was not the receiver. When the same amount of packets return back to the sender we know that the connection is proper and strong and there is no data/packet loss.	**ESR:** The packets also got sent to the PC1 where it was not supposed to go. The packets also took the same path backwards as it took while travelling from sender to receiver .

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So we can see that the topology that we have created works properly. Would you like to create another little complex topology? 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 • **Create the ring topology.** • **Test the topology by sending the packets.**	
Teacher starts slideshow **for slide 20.**	
Teacher Action	**Student Action**
Guide the student to open CPT and open a clean canvas. Can you tell me what you understand when we say ring topology?	*Student opens the CPT* **ESR:** From the name we can understand that the shape / structure of this topology

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Yes! Ring topology is like a bus topology, but with connected ends. The node that receives the message from the previous computer will retransmit to the next node. The data flows only in one direction i.e it's unidirectional. The data in the ring topology flows in a clockwise direction. The most common access method of the ring topology is **token passing**. ● **Token passing:** It is a network access method in which a token is passed from one node to another node. ● **Token:** It is a frame that circulates around the network. It contains the packets/data and the address of the receiver. This token is passed from computer to computer until it reaches the destination. The sender modifies the token by putting the address along with the data.The data is passed from one device to another device until the destination address matches. Once the token is received by the destination device, then it sends the acknowledgment to the sender. What do you think are the advantages and disadvantages of the ring topology? Advantages:- **Network Management:** Faulty devices can be removed from the network without bringing the network down. **Product availability:** Many hardware and software tools	would be circular i.e it would be connected at all ends in a circle. **ESR:** Varied!

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for network operation and monitoring are available. Disadvantages: **Difficult troubleshooting:** It requires specialized test equipment to determine the cable faults. If any fault occurs in the cable, then it would disrupt the communication for all the nodes. **Failure:** The breakdown in one station leads to the failure of the overall network. **Reconfiguration is difficult:** Adding new devices to the network would slow down the network. Now let's start creating this topology and see how it works. What are the things that we need to create this topology? Let's create this using 4 switches and end devices. *The teacher guides the student to pick 4 switches and 4 end devices to the screen from the lower panel.*	**ESR:** We need switches, wires and end devices. *The student picks 4 switches and 4 end devices to the screen from the lower panel.*

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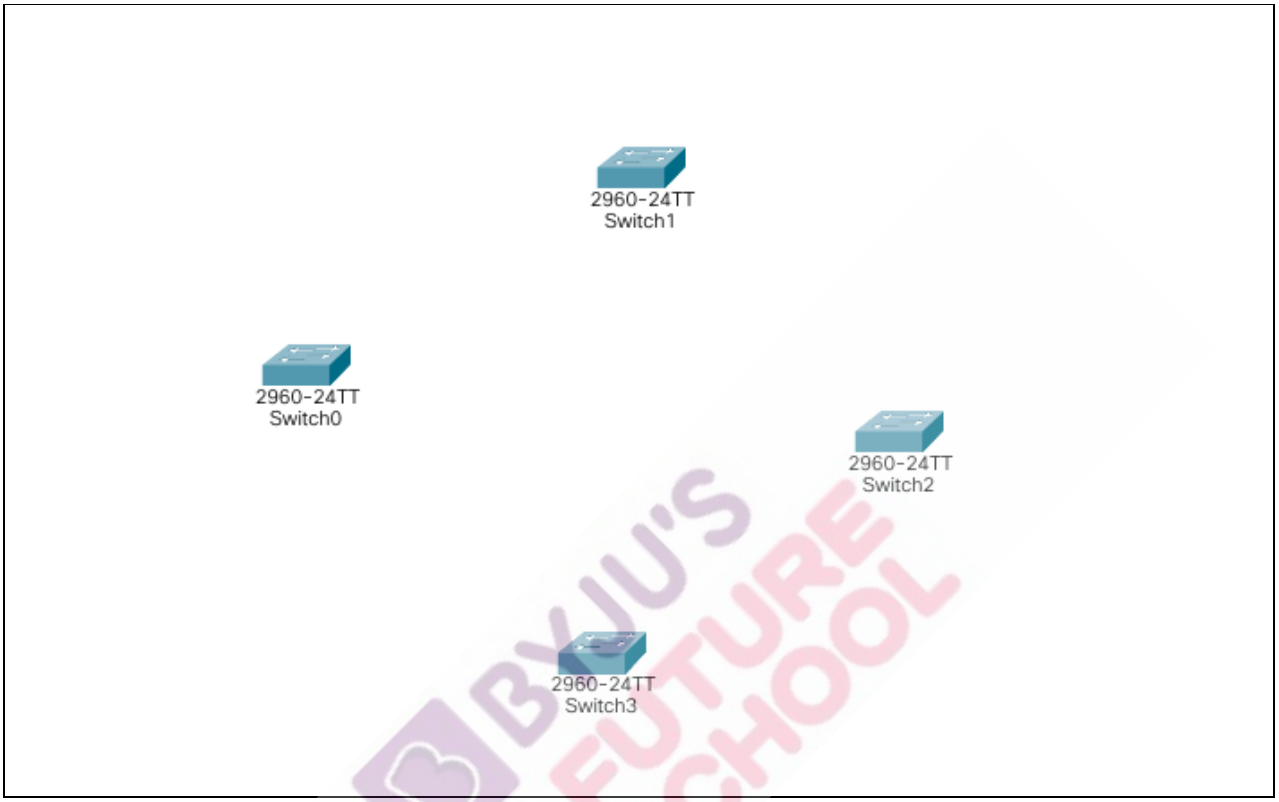
Picking the switches from the panel.



Picking end devices form panel .

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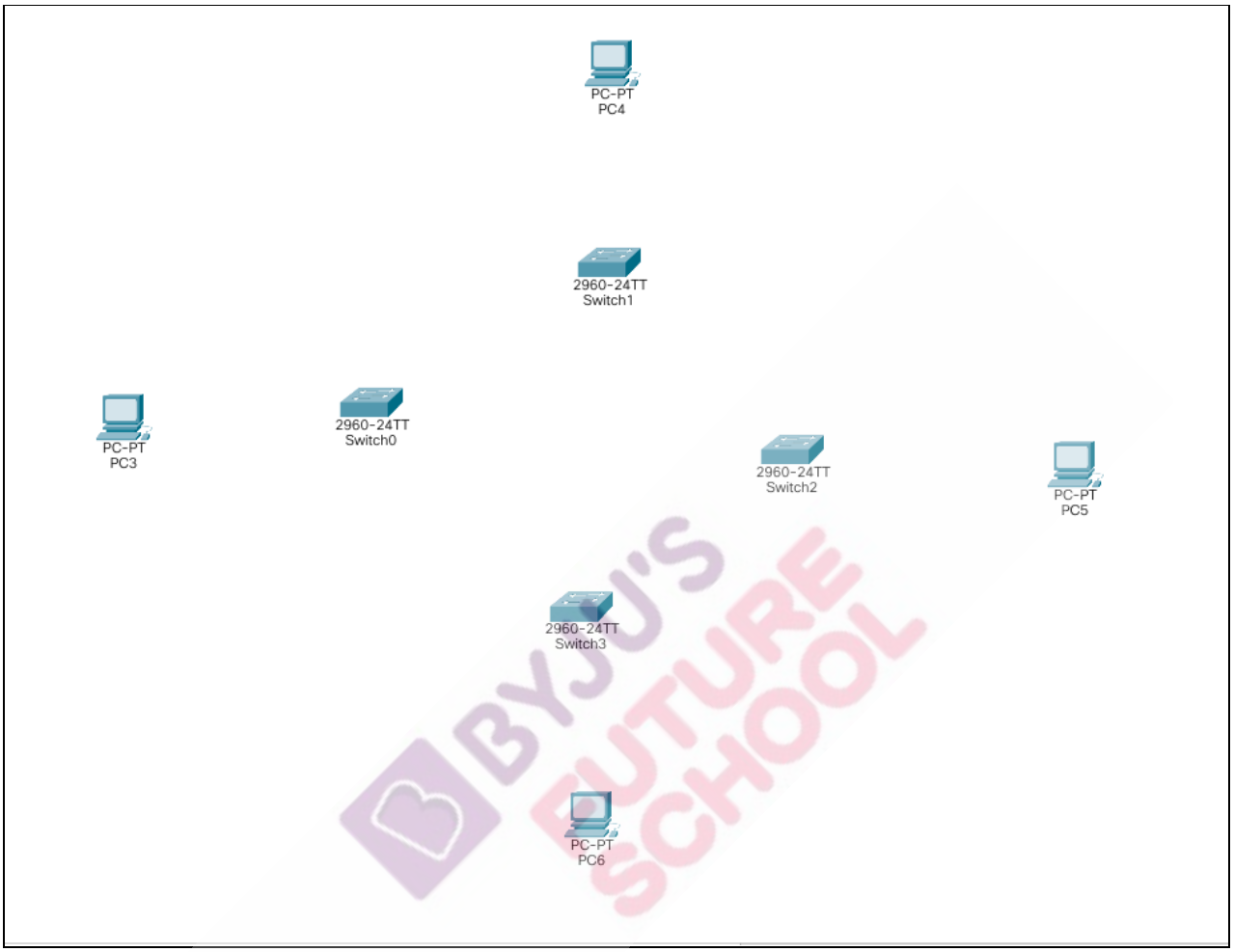

Now what do we need to do? Yes! *The teacher guides the student to connect the devices with the cables and add IP to the end devices.*	**ESR:** We need to connect the devices with the wires and add IP to the end devices. *The student connects the devices with the cables and add IP to the end devices.*

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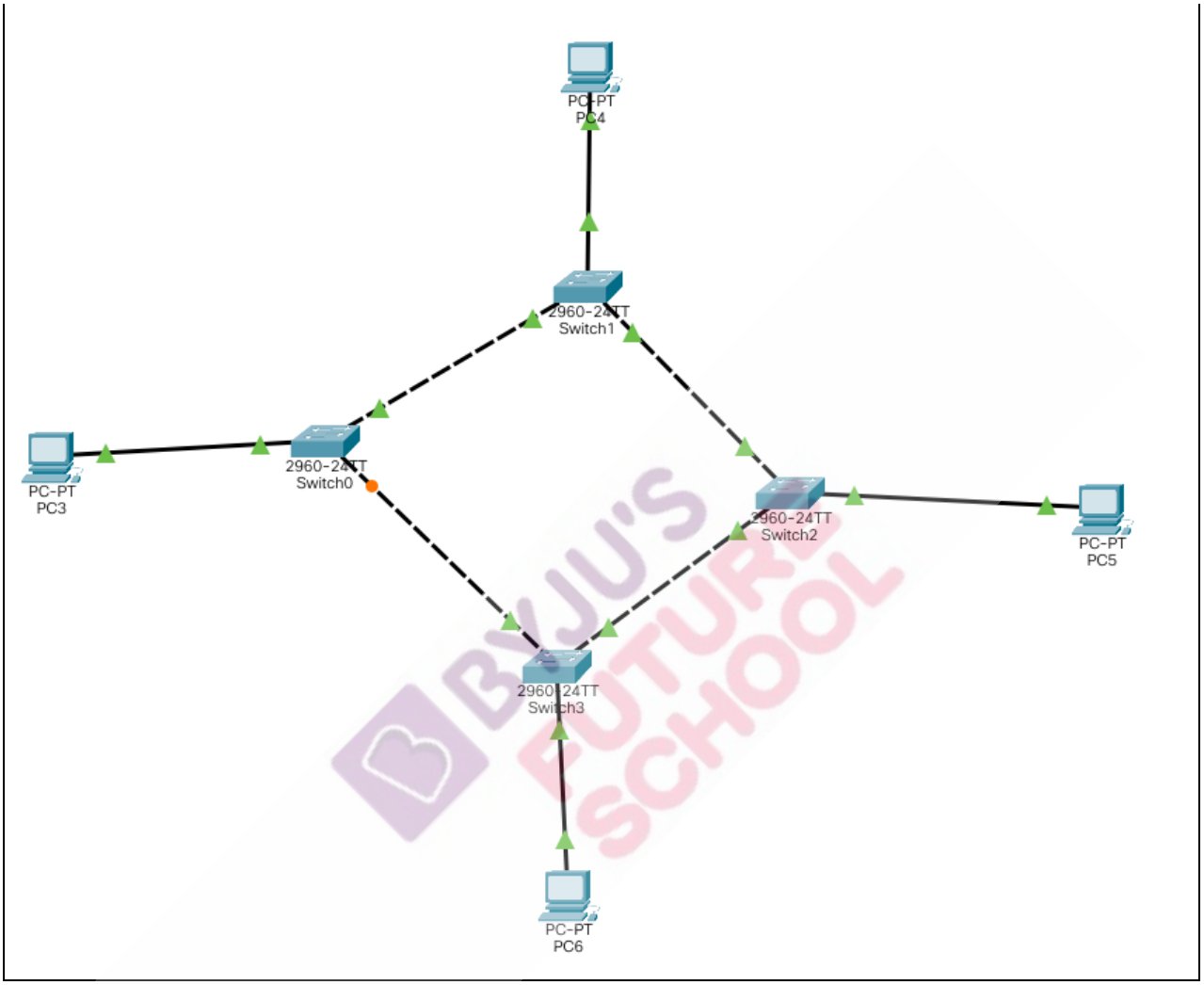
Connect the devices with the cables.



Set the IP to the end devices.

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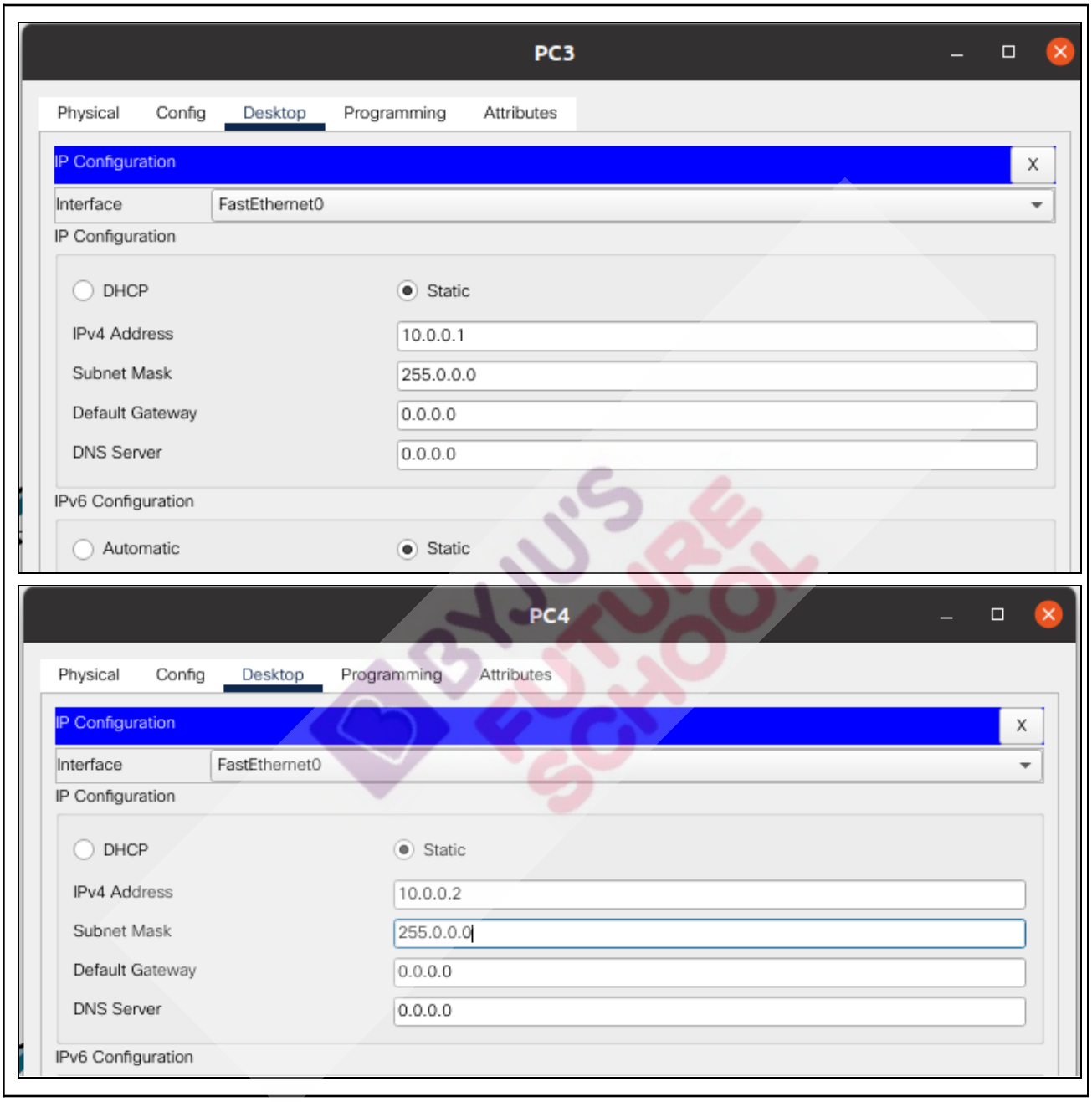

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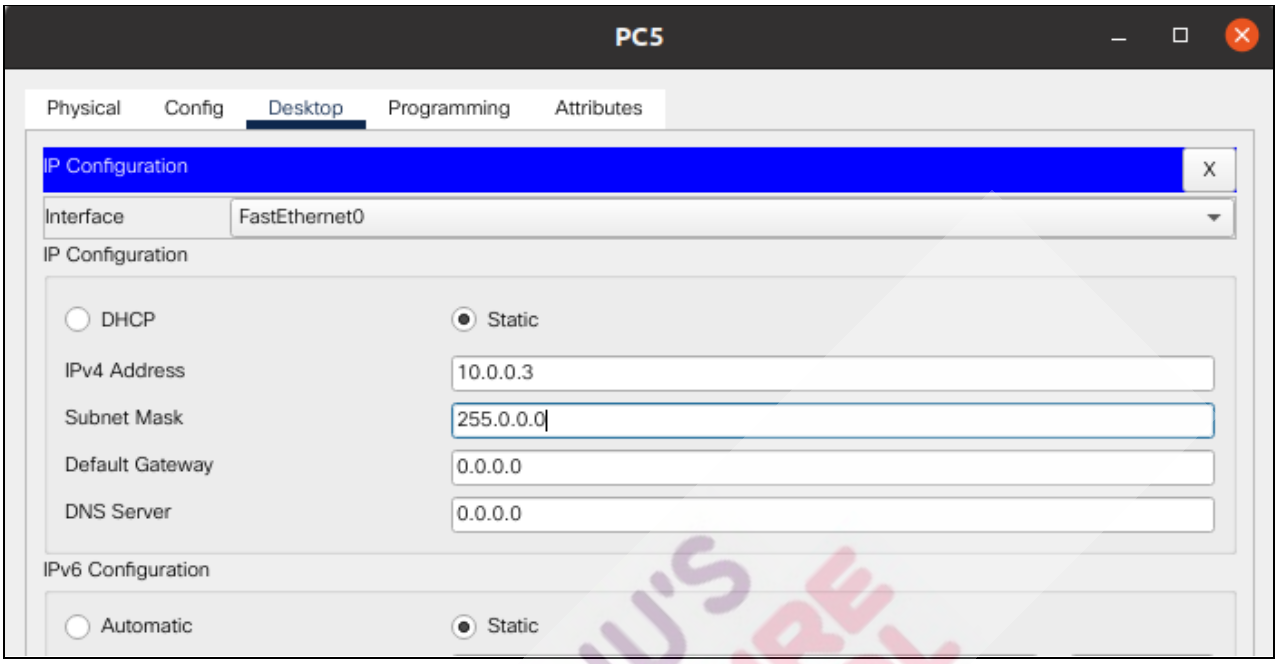

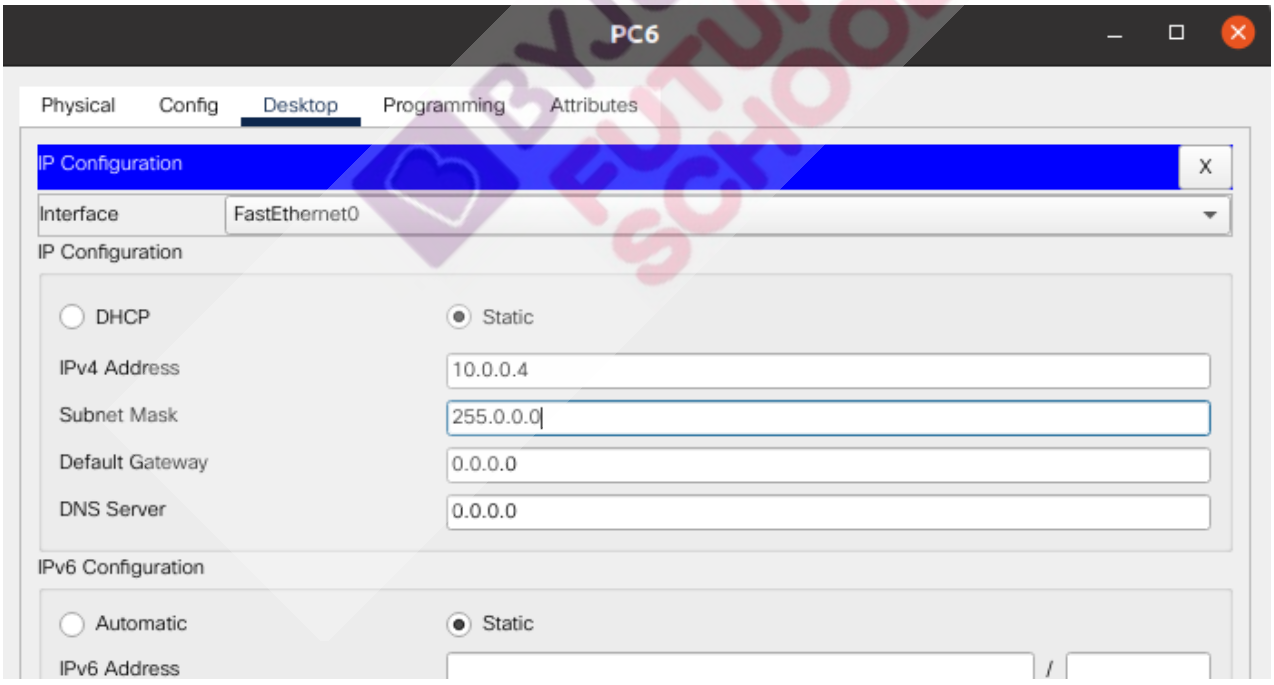

Great work!

Now we just need to test this topology.

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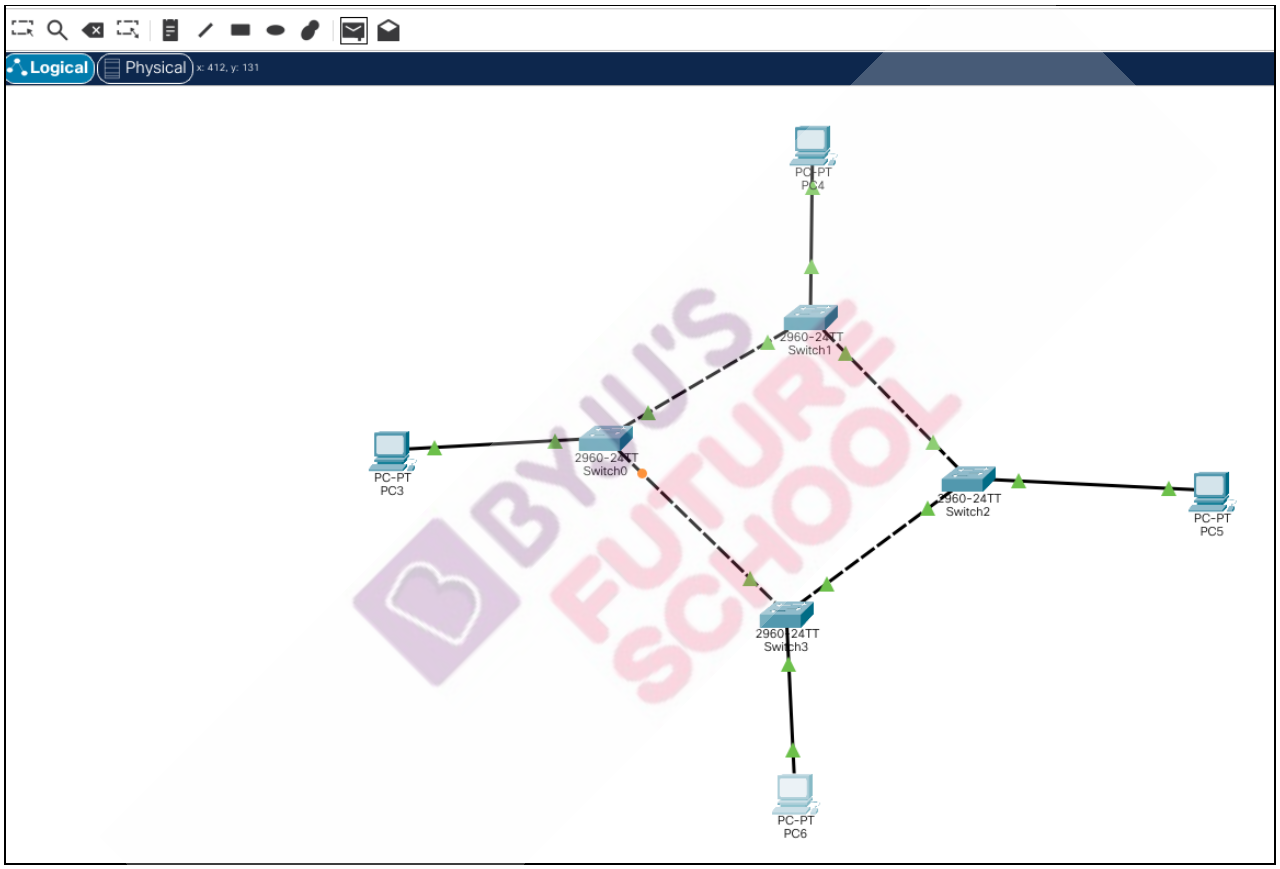
Let's test it by sending the data from PC3 to PC6. The teacher guides the student to send the data from PC3 to PC6	

Select the envelope sign.



Click on the PC3 as sender and PC6 as receiver.

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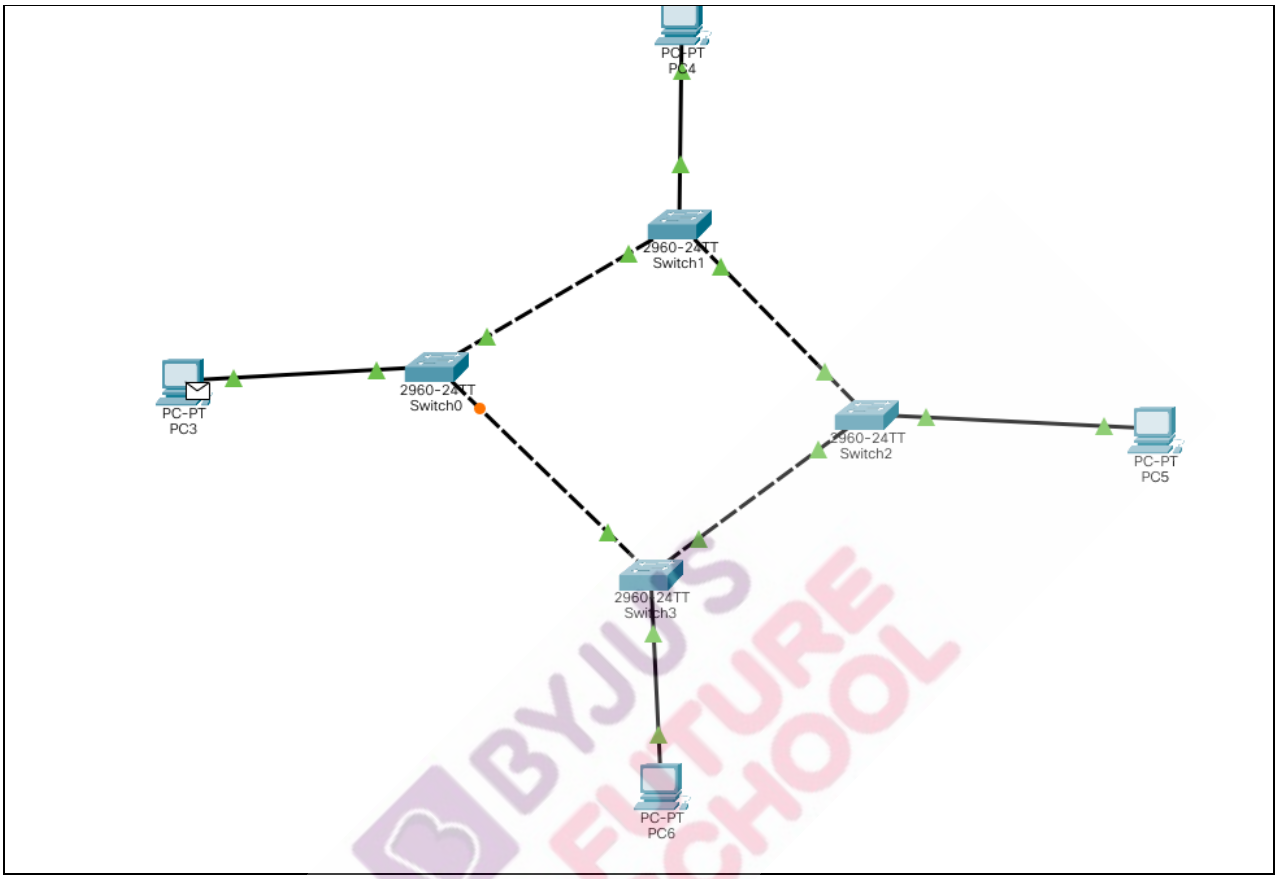

Click on simulation to see the simulation. And use the forward button to play the simulation.

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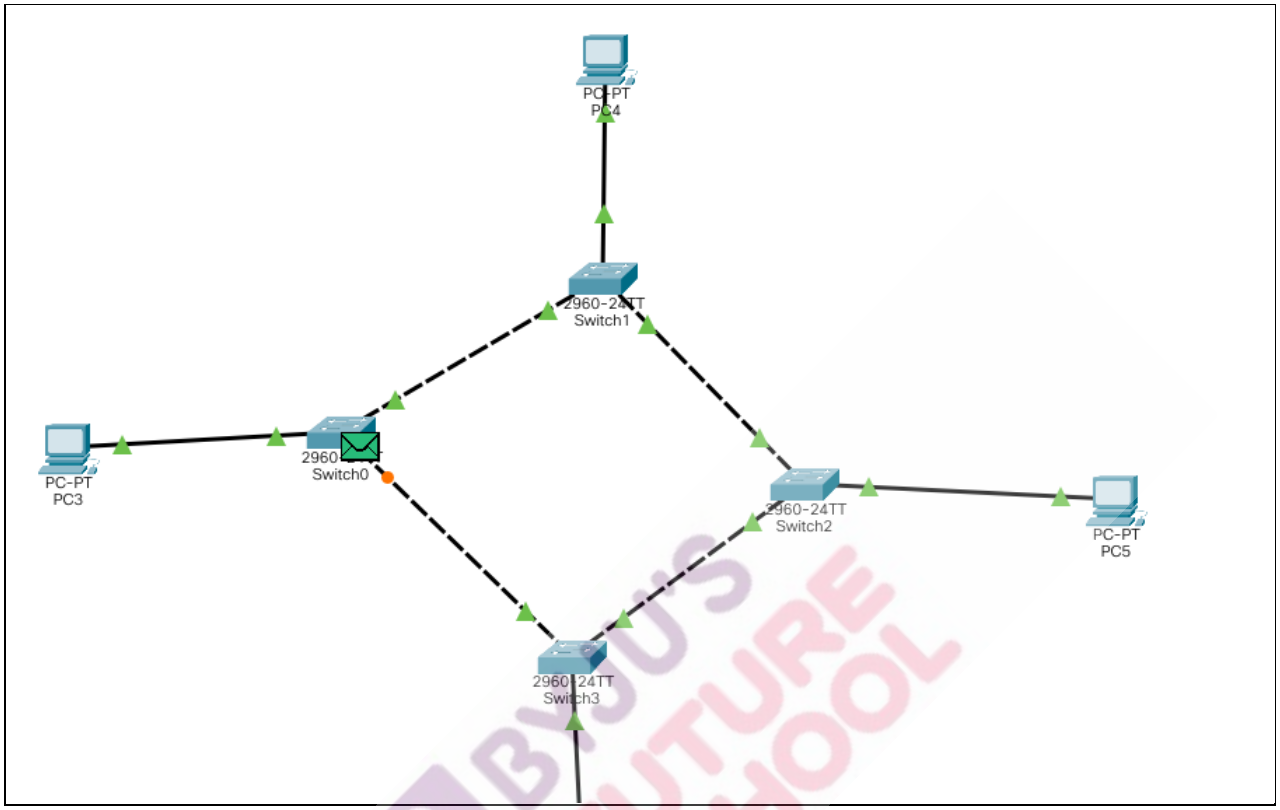

Data moving from switch 0 to switch 1.

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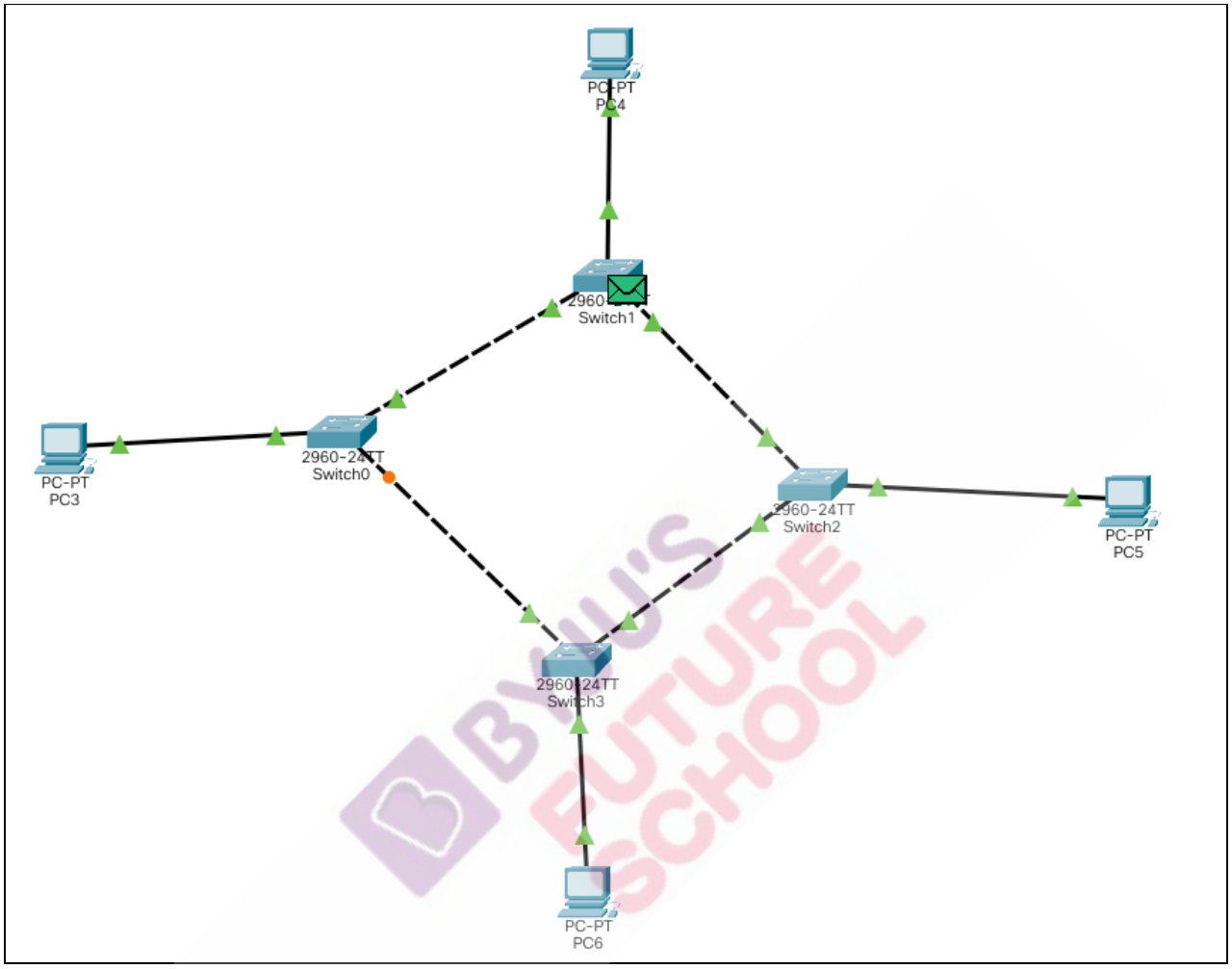

Data moving from Switch 1 to switch 2.

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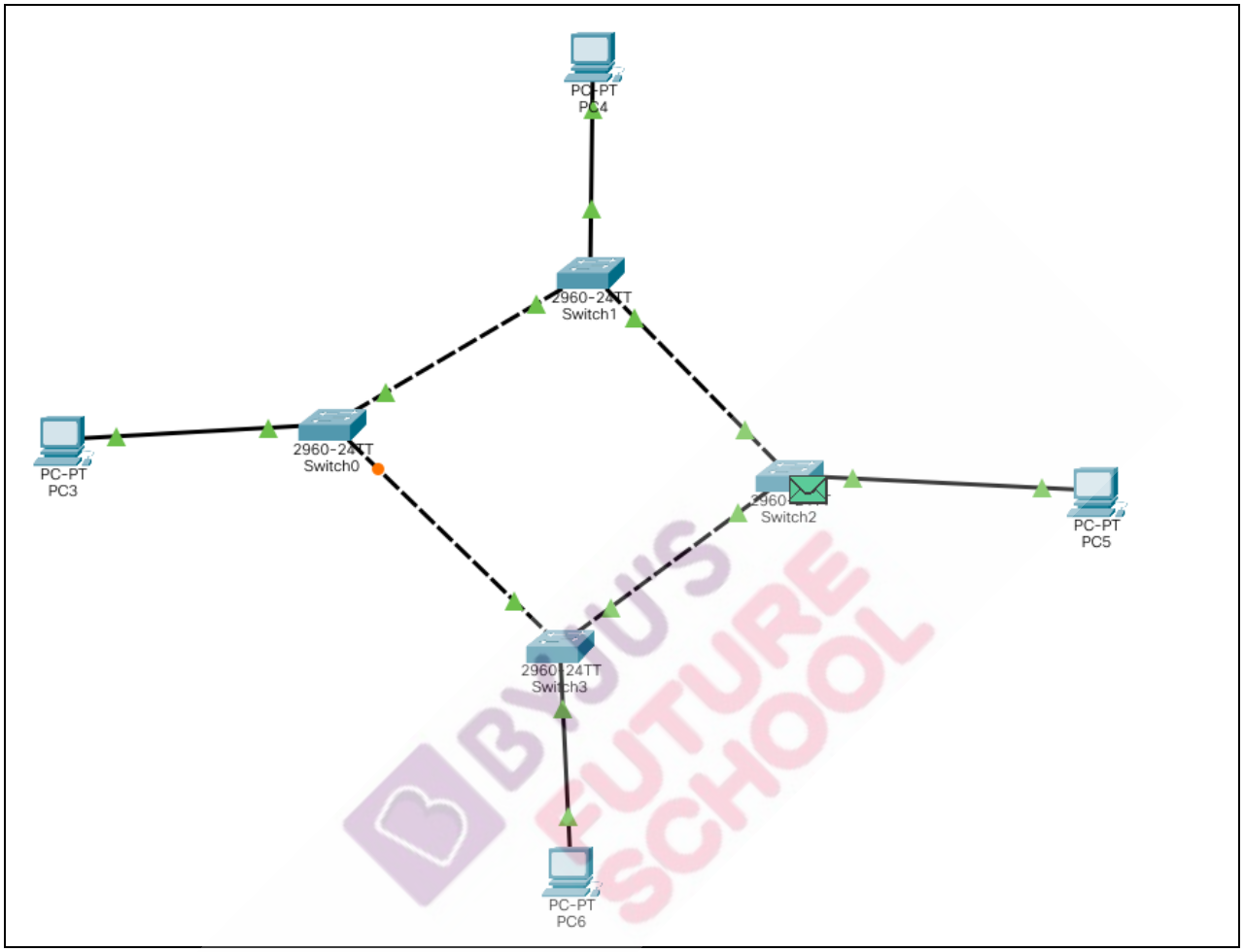

Data moving from Switch 2 to switch 3.

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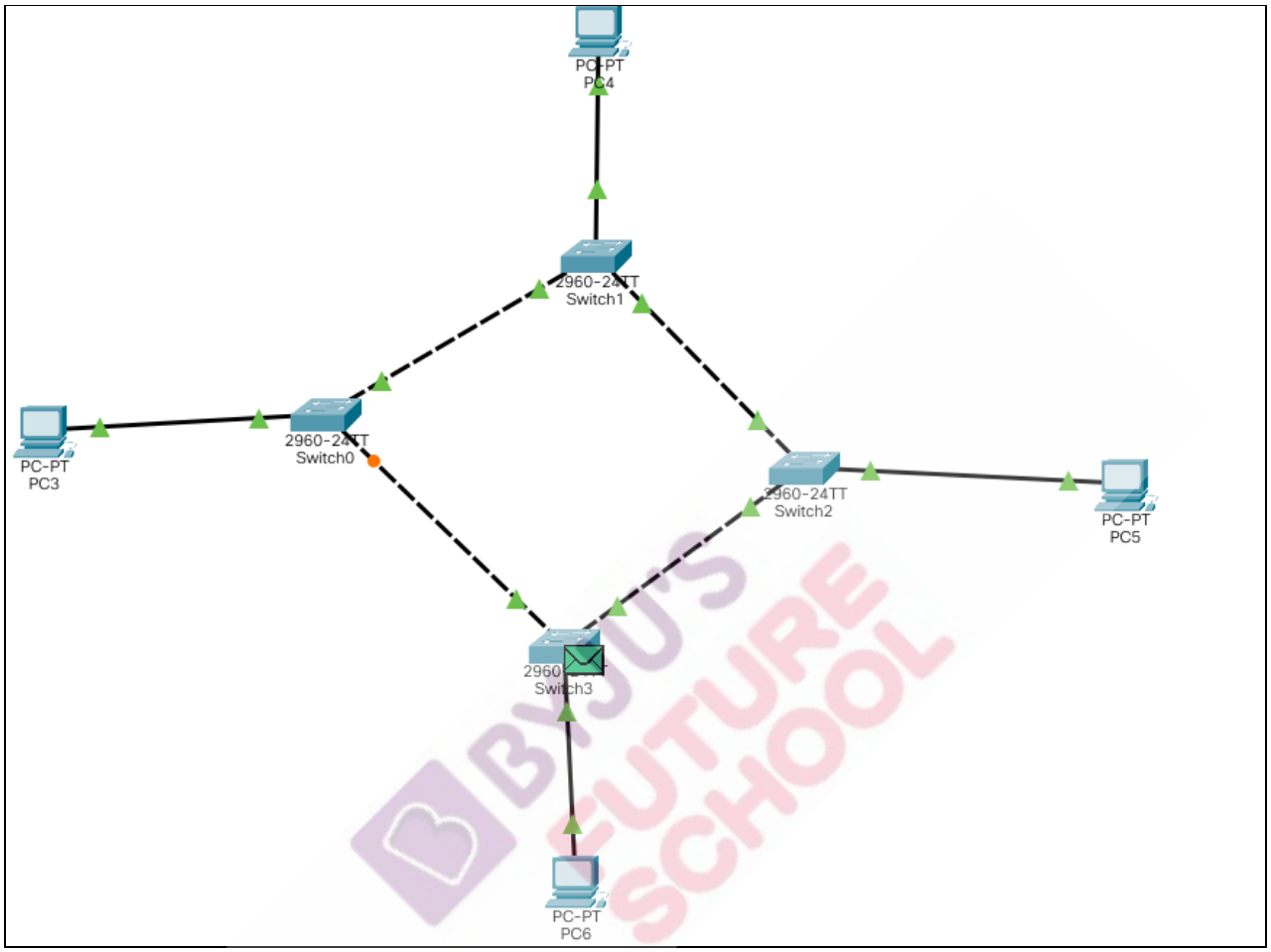

Data moving from switch3 to PC6.

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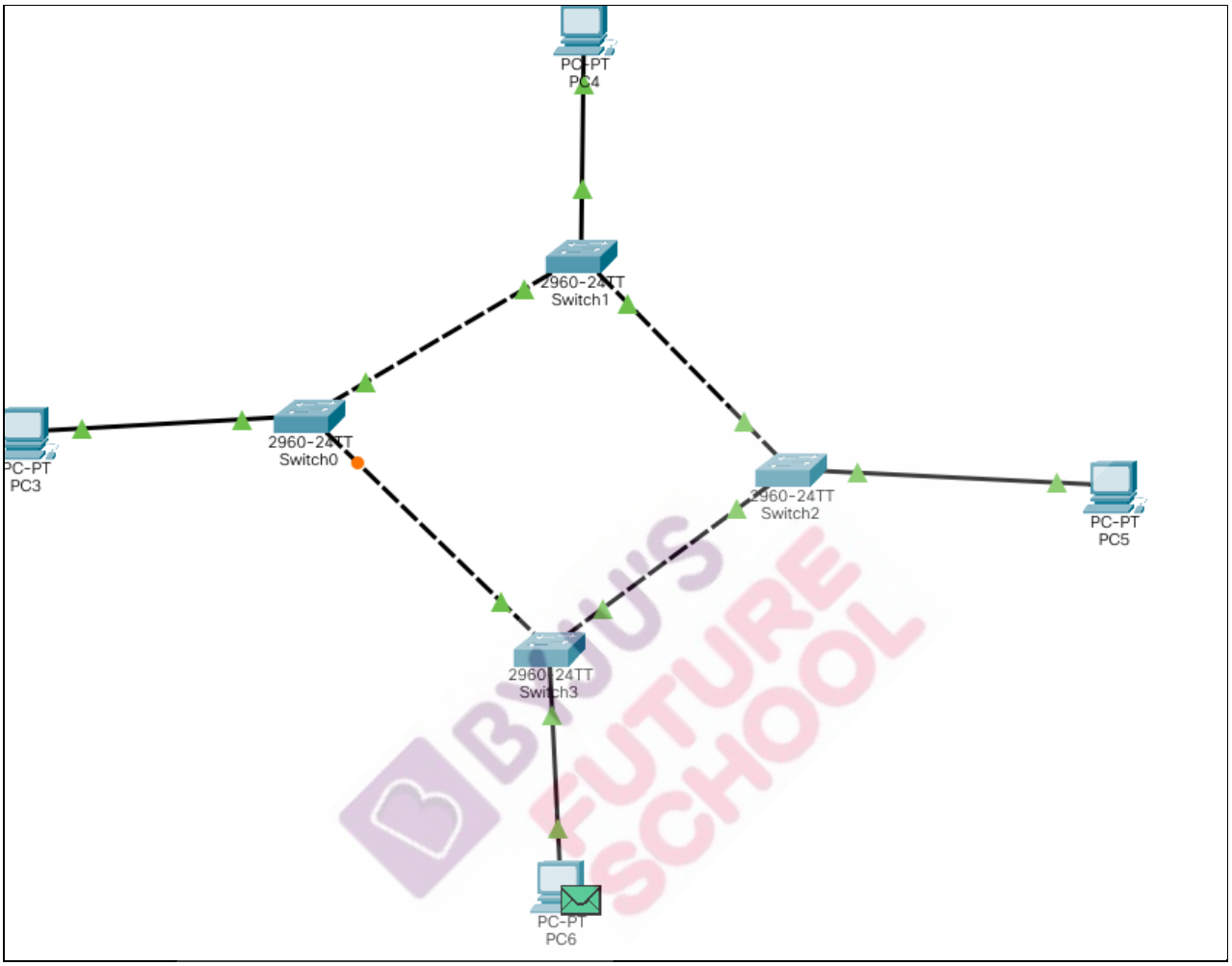

Note:- As you continue the simulation you can see the data being sent back the same path.

Awesome ! We can see the working of this topology too .	

Teacher Guides Student to Stop Screen Share

WRAP-UP SESSION - 5 Mins

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Teacher starts slideshow from slide 21 to slide 31	
Activity details	**Solution/Guidelines**
Run the presentation from slide 18 to slide 28 **Following are the wrap-up session deliverables:** • **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**
The way in which constituent parts are interrelated or arranged is called? a) Arrangement b) Interrelation c) Topography d) Topology	**D**
What type of topology connects all stations/switches through the backbone cable? a) Mesh Topology b) Bus topology c) Star Topology d) Ring Topology	**B**

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Ring topology has: a) Connected ends and data flow is in clockwise direction b) Connected ends and data flow is in anti-clockwise direction c) Disconnected ends and data flow is in clockwise direction d) Disconnected ends and data flow is in anti-clockwise direction	**A**
End the quiz panel	
FEEDBACK • **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.**	
You get Hats Off for your excellent work! Awesome!	*Make sure you have given at least 2 Hats Off during the class for:*
Project Overview **NETWORK TOPOLOGIES** In Class, we learned about some topologies such as bus and star topology. We also learn to create simulations for them in Cisco Packet Tracer.	

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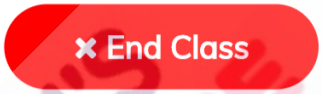
Story: The Internet is a network of billions of computers. All these computers are connected to some or the other routers. The routers help to connect the LAN together to create a bigger network.	
Teacher ends slideshow	
Teacher Clicks 	
Additional Activities There are multiple other topologies such as star topology, mesh topology and hybrid topology. Have the student create these and try sending data through various ways and not the outputs.	*The student creates and tests other topologies.*

Activity Name	Description	Link
Teacher Activity 1	solution	https://drive.google.com/file/d/1QhrXbTcknud2KvPkTzj42MWCmvLbwD46/view?usp=sharing
Student Activity 1	Solution	https://drive.google.com/file/d/1fKWE08ON7ygJcOrYHxot4y1hrz-2gXX2/view?usp=sharing
Addition activity	Solution	Star topology:-

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		https://drive.google.com/file/d/1bzFkWOnPgkAZel-iEdfx4LH2WIlH2_tn/view?usp=sharing Mesh topology:- https://drive.google.com/file/d/1bzFkWOnPgkAZel-iEdfx4LH2WIlH2_tn/view?usp=sharing
Teacher Reference In-class quiz	In-class quiz	https://docs.google.com/document/d/1JsWArUkkG5TyNsp6FweVFDyEq4vhkAYBOvmcaznWdI8/edit

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