

Experiment 1

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Class: TE COMPS

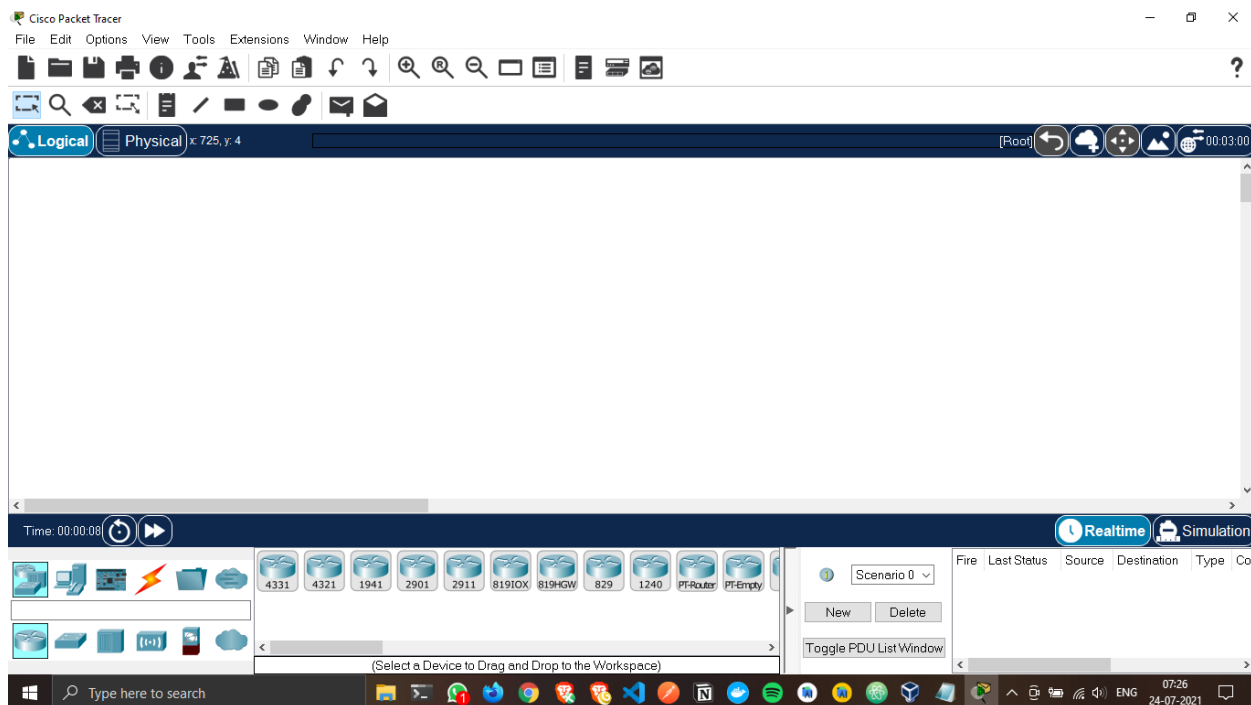
XIE ID: 2020012004

Date: 24-07-2021

Aim: To Study Design and analysis of Internetworking Devices using Network simulation Tools. (Using Cisco Packet Tracer)

Part 1A: Understanding the Hub

Step1: Open the Cisco Packet Tracer software

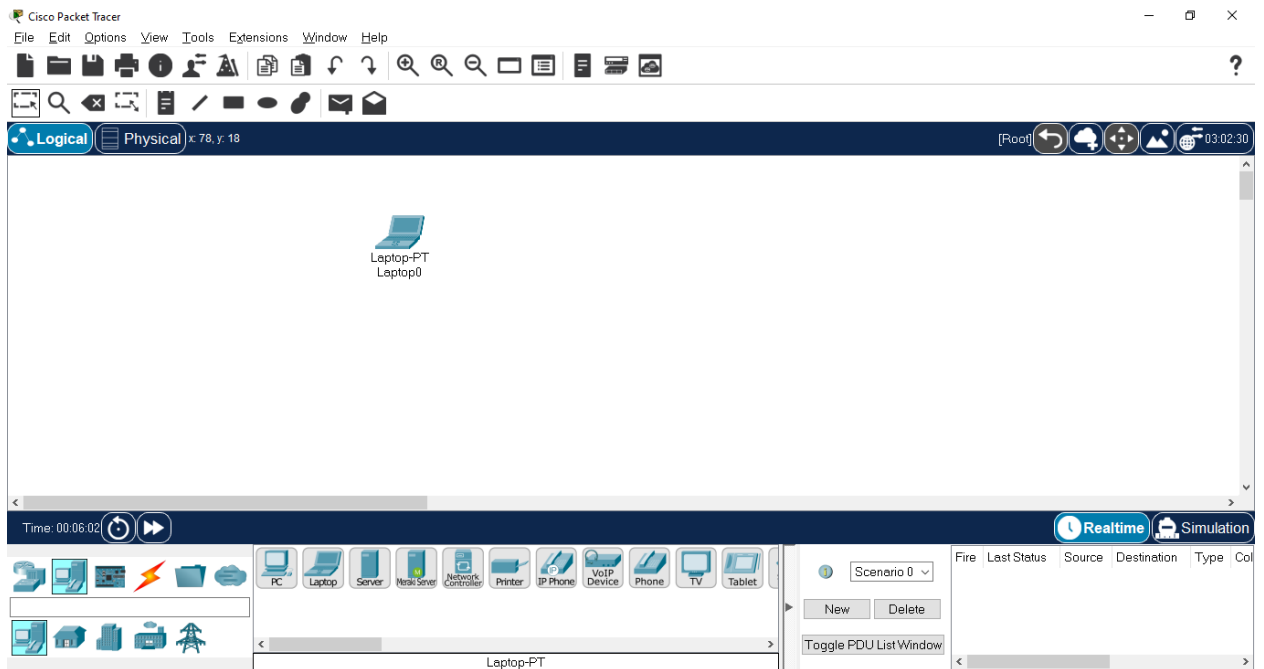


Step 2: Add the devices that the LAN will comprise

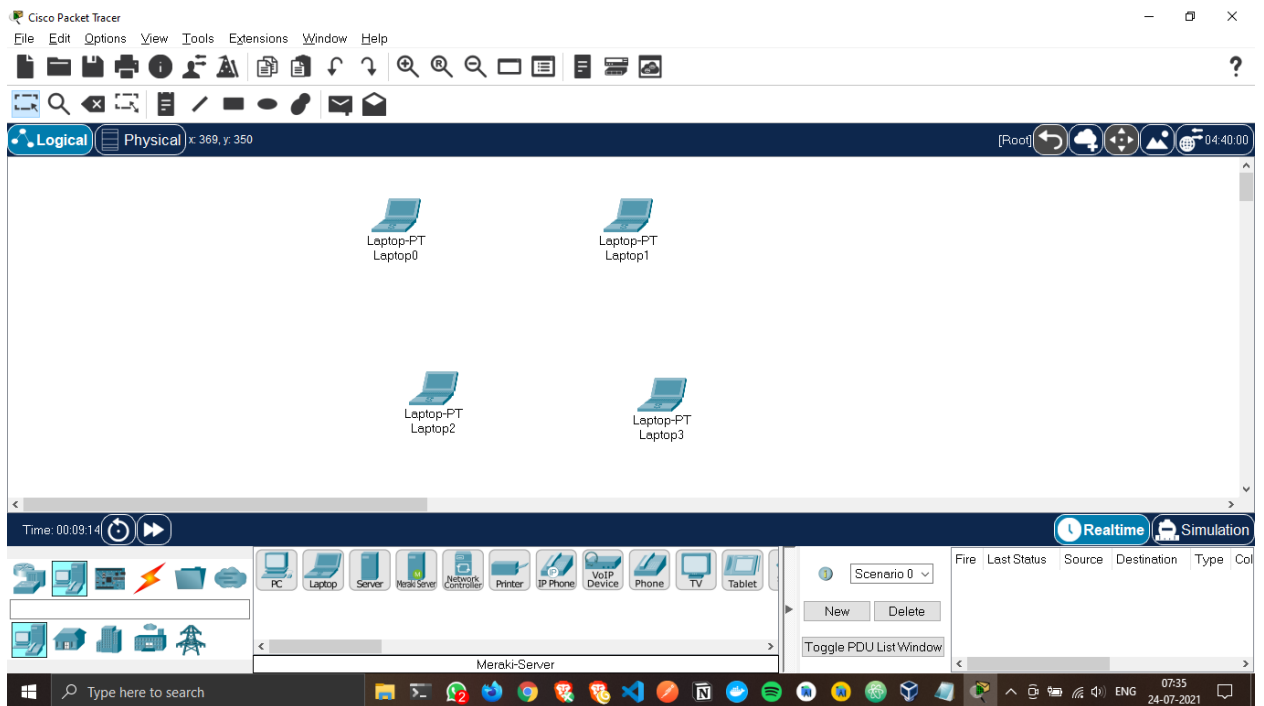
- In the bottom bar below, click the second button from the left called **End Devices**



- Then select the device that you want to use. You can use a **PC** but I like to use a **Laptop**
- Next, drag and drop the Laptop to the whitespace, exactly above the bar

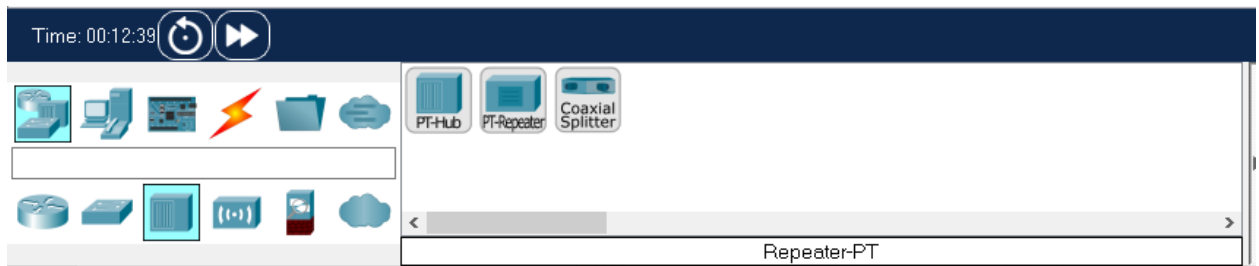


- Now repeat the previous step until you have the amount of Laptops or PCs you want in the network. I will add 4, you can add as many as you want.

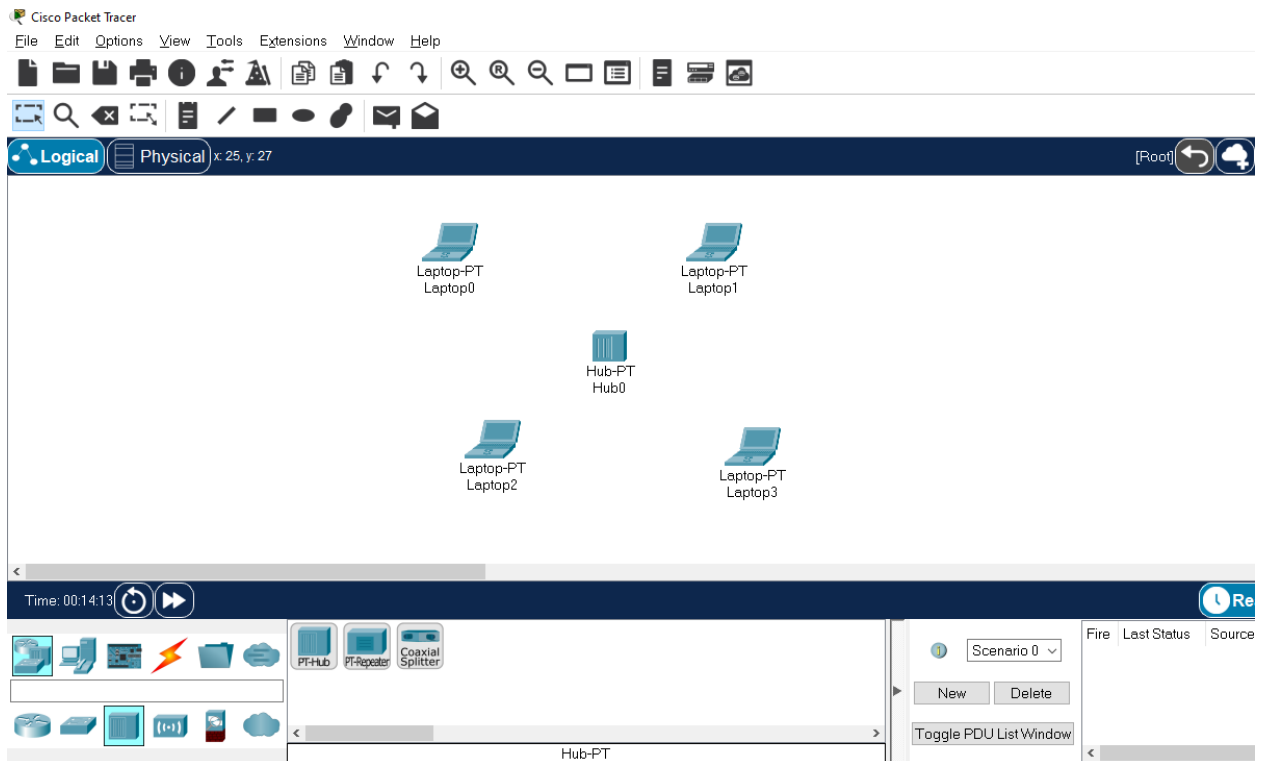


Step 3: Add the Hub that will connect the devices

- In the bottom bar, again, click the left most option that says **Network Devices**, then in the bar exactly below that click the **Hub** option



- Choose the **PT-Hub** device from the right bar
- Drag and drop the hub in the whitespace such that it is in the middle surrounded by the other devices.

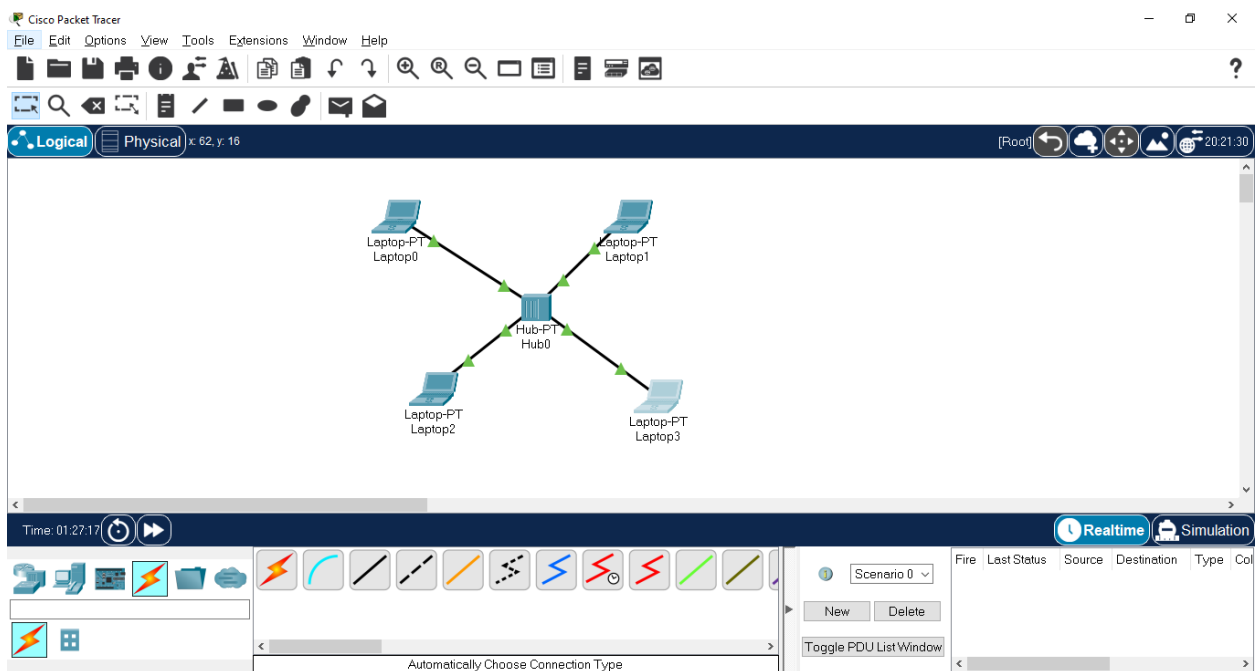


Step 4: Wire up everything

- Back to the bottom bar, select the orange lightning icon called **Connections**



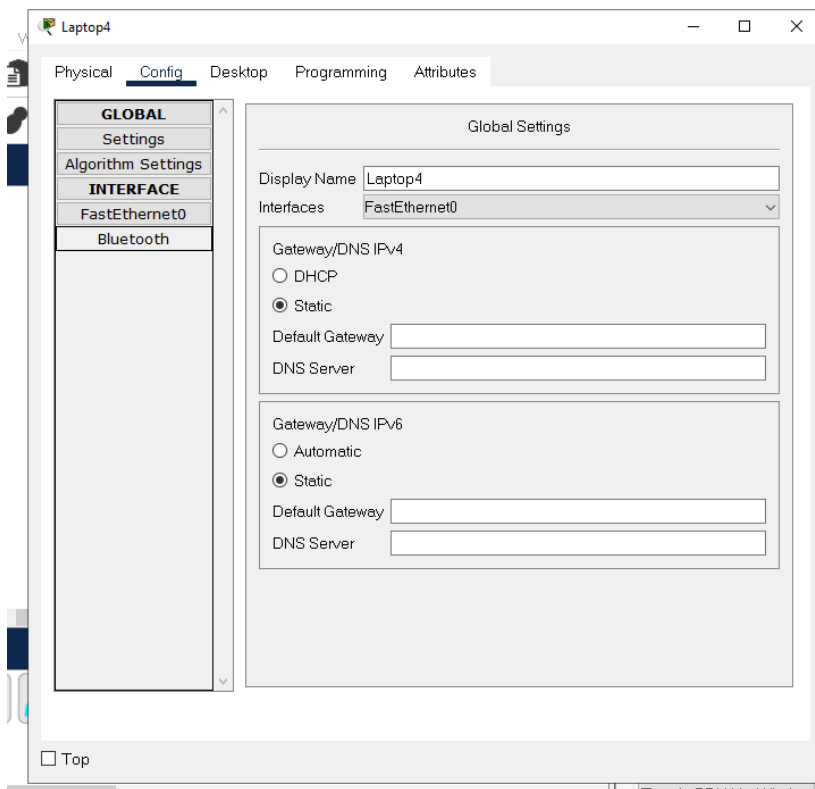
- Now choose the orange lightning icon again but this time from the right bar.
- After clicking it, click each Laptop and then click the Hub to connect them to the Hub
- After doing that you should have something like this:



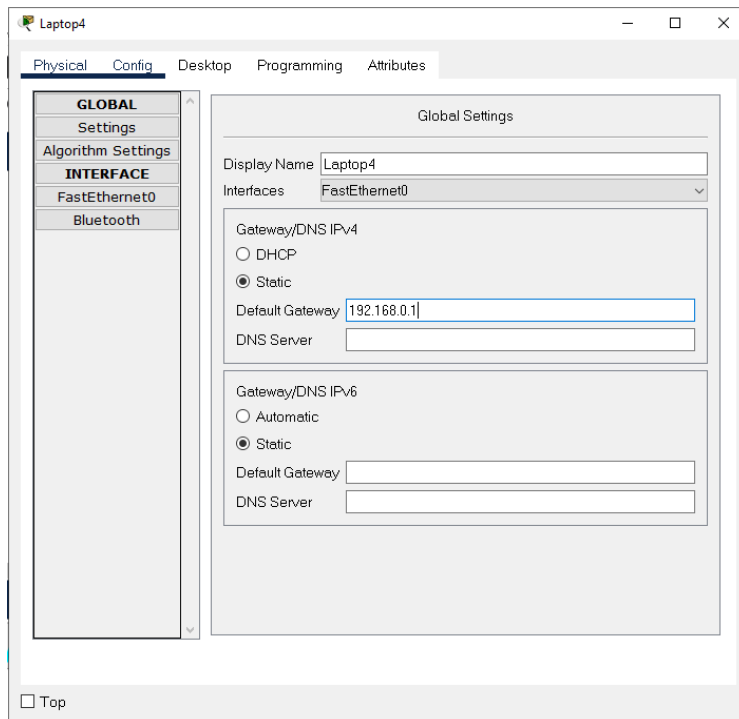
- And done! You created a simple LAN using a Hub

Step 5: Setting up the devices

- Now click one of the laptops in your network and click the **Config** tab



- Now we'll give the laptop a default gateway. In the **Gateway/DNS IPv4** section, give your laptop a default gateway. I will give my devices a gateway of 192.168.0.1



- Next, we'll give the laptop an IP address of its own.

- With the window still open, click the **FastEthernet0** button

The screenshot shows the configuration window for the **FastEthernet0** interface on a device named **Laptop4**. The window has a title bar with standard minimize, maximize, and close buttons. Below the title bar are tabs for **Physical**, **Config** (selected), **Desktop**, **Programming**, and **Attributes**.

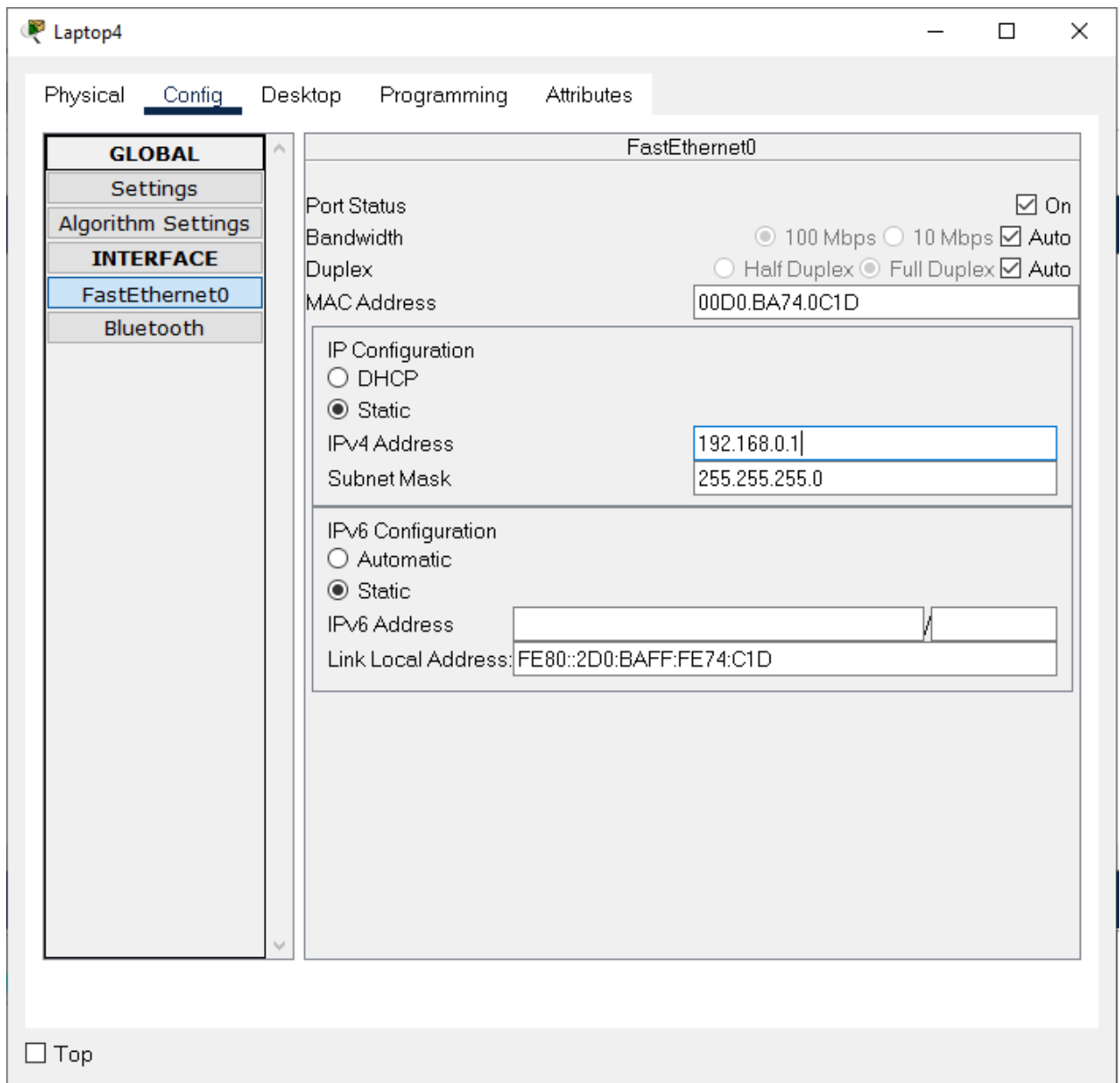
On the left side, there is a sidebar with a tree view. The **GLOBAL** section contains **Settings** and **Algorithm Settings**. The **INTERFACE** section contains **FastEthernet0** (highlighted in blue) and **Bluetooth**.

The main configuration area for **FastEthernet0** includes the following settings:

- Port Status:** ☒ On
- Bandwidth:** ☒ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex:** ☐ Half Duplex ☒ Full Duplex ☒ Auto
- MAC Address:** 00D0.BA74.0C1D
- IP Configuration:** ☐ DHCP ☒ Static
 - IPv4 Address:** [Empty text box]
 - Subnet Mask:** [Empty text box]
- IPv6 Configuration:** ☐ Automatic ☒ Static
 - IPv6 Address:** [Empty text box]
 - Link Local Address:** FE80::2D0:BAFF:FE74:C1D

At the bottom left of the window, there is a **Top** button with a small square icon next to it.

- Now in the **IP Configuration** section, give your laptop an IP address which can be anything from 192.168.0.2-254 (because remember 192.168.0.1 is our gateway).



- Notice that when you click enter after entering the IP address, the software will automatically detect your Subnet Mask.
- Now repeat these steps for all the laptops in you network
- Done! You have successfully set up a simple LAN using a Switch

Advantages of a Hub:

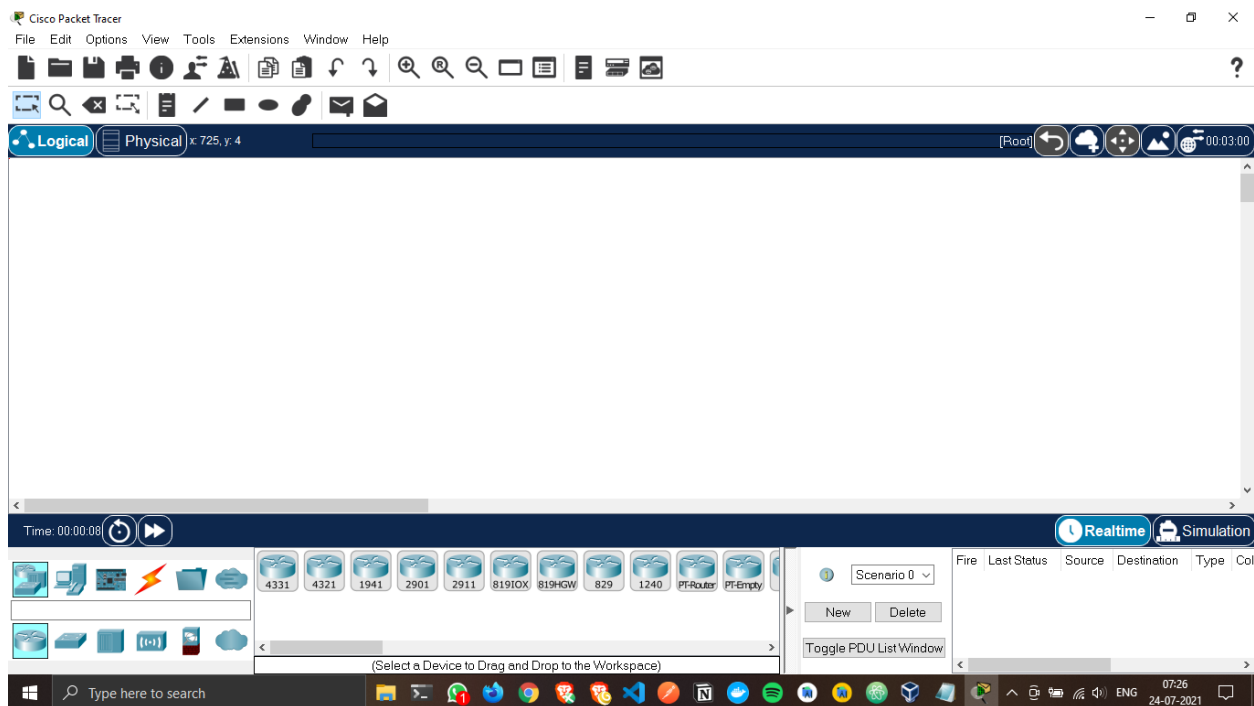
- It is fairly easy to set up
- Since it does exactly one thing, it is fast
- They are not as expensive when compared to switches

Disadvantages of a Hub:

- Hubs have the problem of collision
- Hub can send data in only one direction at a time
- A hub broadcasts data to all the devices all the time, this can be a security issue in many cases.

Part 1B: Understanding the Switch

Step1: Open the Cisco Packet Tracer software



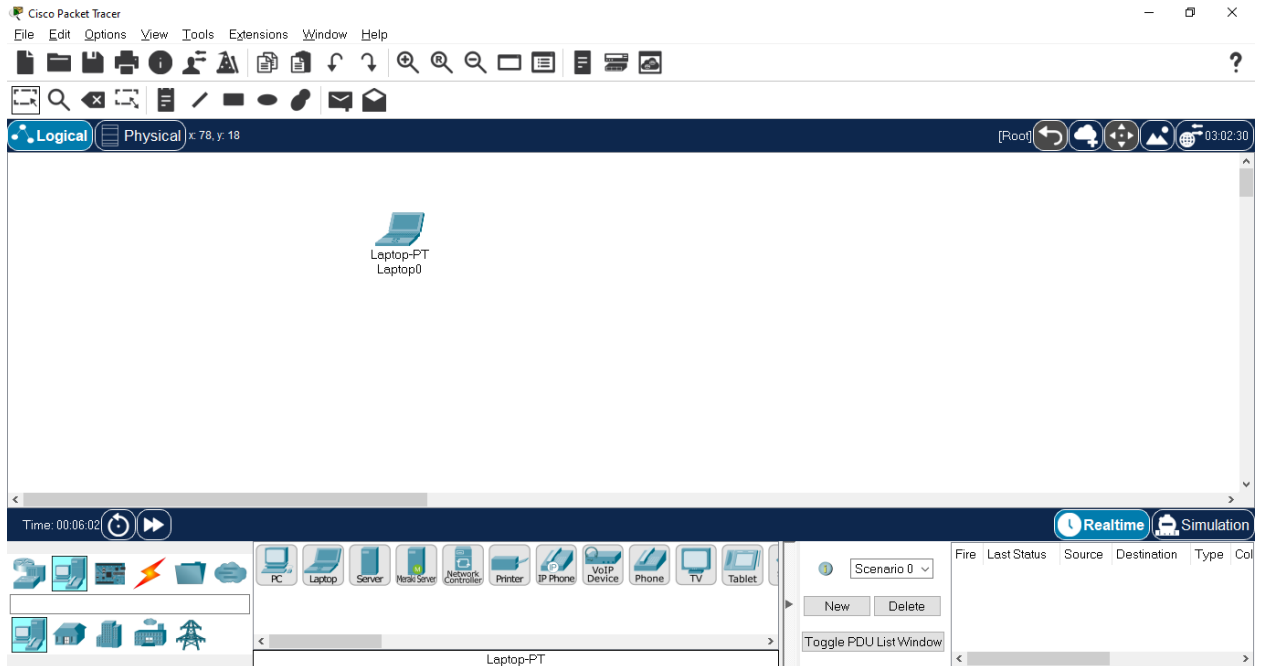
Step 2: Add the devices that the LAN will comprise

- In the bottom bar below, click the second button from the left called **End Devices**

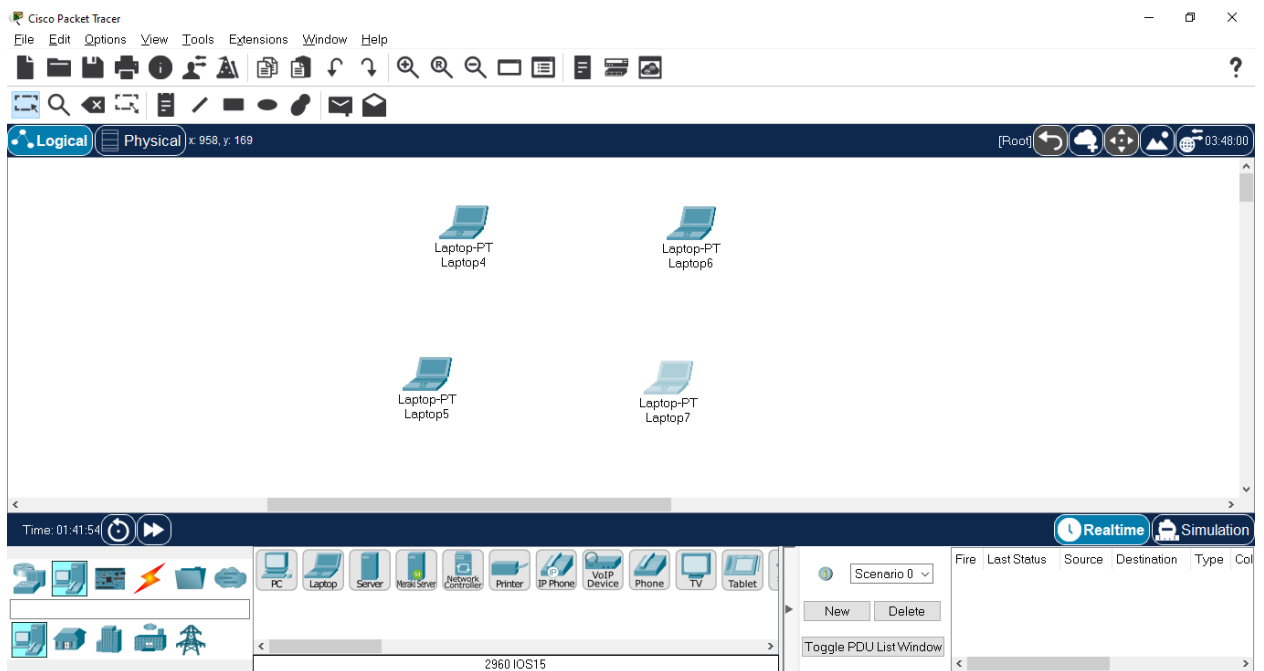


- Then select the device that you want to use. You can use a **PC** but I like to use a **Laptop**

- Next, drag and drop the Laptop to the whitespace, exactly above the bar

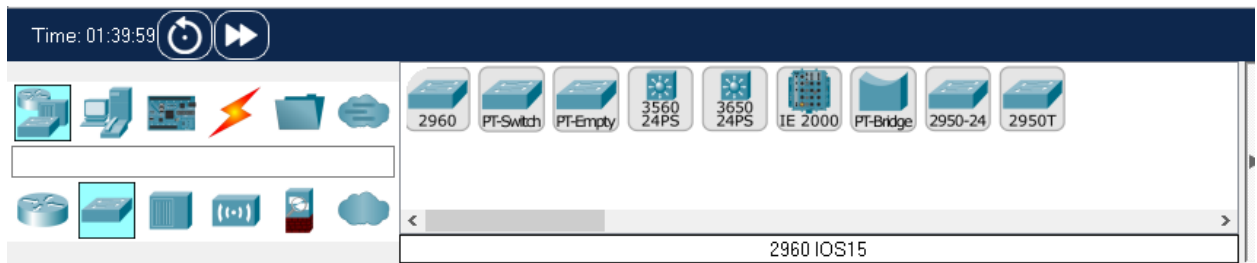


- Now repeat the previous step until you have the amount of Laptops or PCs you want in the network. I will add 4, you can add as many as you want.



Step 3: Add the switch that will connect the devices

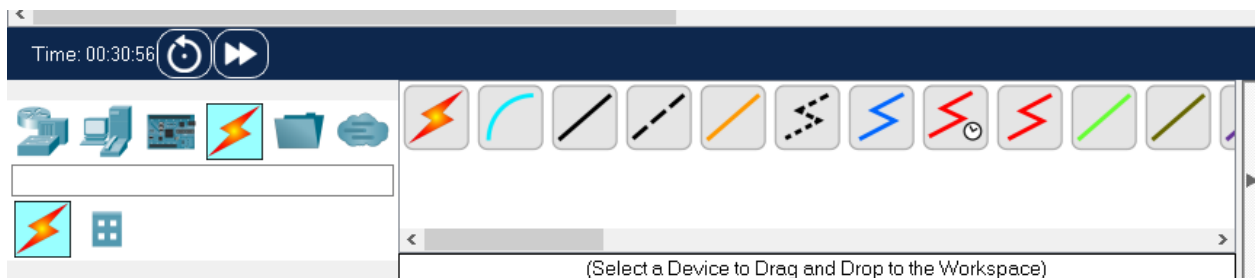
- In the bottom bar, again, click the left most option that says **Network Devices**, then in the bar exactly below that click the **Switch** option



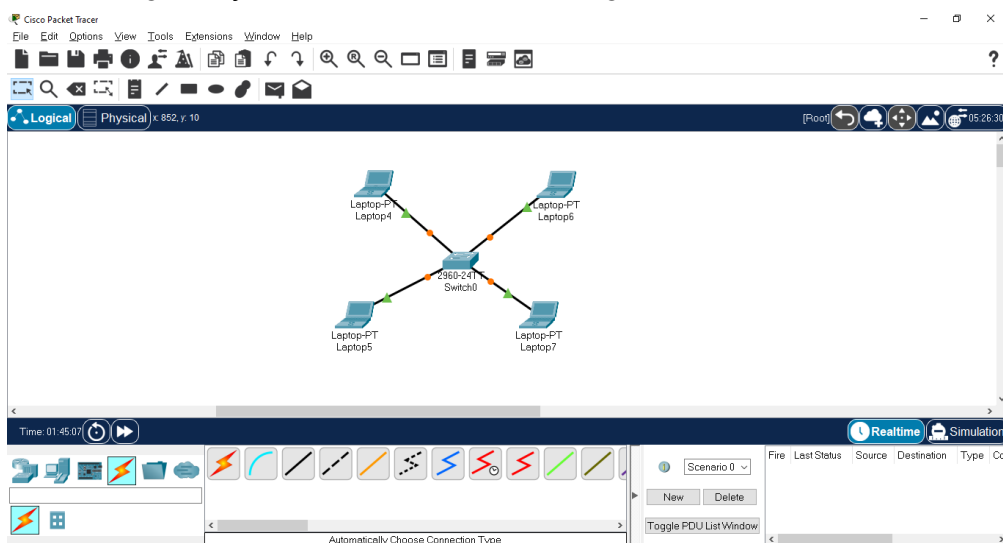
- Choose the **2960** or **PT-Switch** device from the right bar
- Drag and drop the switch in the workspace such that it is in the middle surrounded by the other devices.

Step 4: Wire up everything

- Back to the bottom bar, select the orange lightning icon called **Connections**

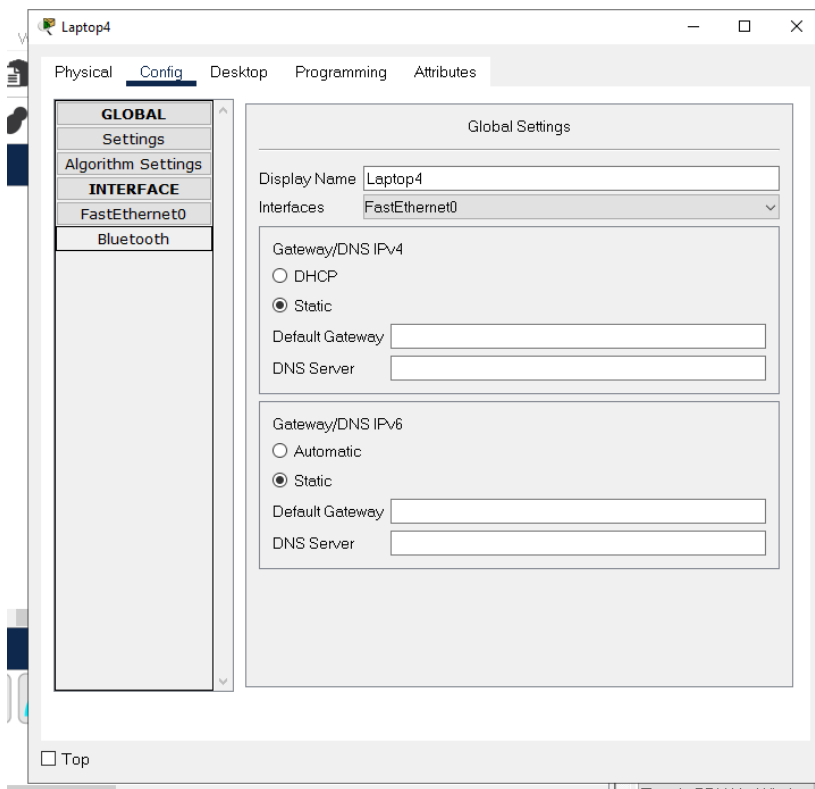


- Now choose the orange lightning icon again but this time from the right bar.
- After clicking it, click each Laptop and then click the Switch to connect them to the Switch
- After doing that you should have something like this:

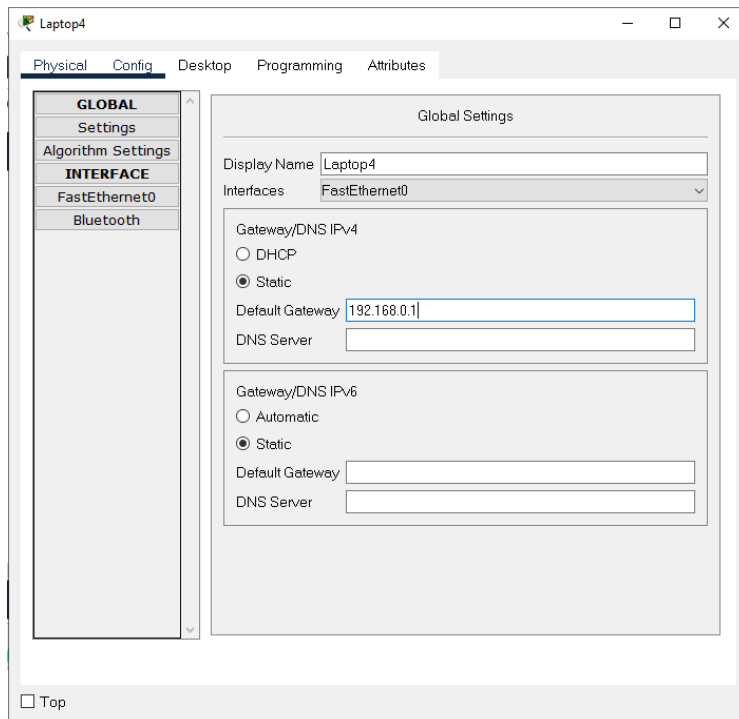


Step 5: Setting up the devices

- Now click one of the laptops in your network and click the **Config** tab



- Now we'll give the laptop a default gateway. In the **Gateway/DNS IPv4** section, give your laptop a default gateway. I will give my devices a gateway of 192.168.0.1



- Next, we'll give the laptop an IP address of its own.

- With the window still open, click the **FastEthernet0** button

The screenshot shows the configuration window for the **FastEthernet0** interface on a device named **Laptop4**. The window has a title bar with standard minimize, maximize, and close buttons. Below the title bar are tabs for **Physical**, **Config** (selected), **Desktop**, **Programming**, and **Attributes**.

On the left side, there is a sidebar with a tree view. The **GLOBAL** section includes **Settings** and **Algorithm Settings**. The **INTERFACE** section includes **FastEthernet0** (highlighted in blue) and **Bluetooth**.

The main configuration area for **FastEthernet0** contains the following settings:

- Port Status:** ☒ On
- Bandwidth:** ☒ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex:** ☐ Half Duplex ☒ Full Duplex ☒ Auto
- MAC Address:** 00D0.BA74.0C1D
- IP Configuration:** ☐ DHCP ☒ Static
 - IPv4 Address:** [Empty text box]
 - Subnet Mask:** [Empty text box]
- IPv6 Configuration:** ☐ Automatic ☒ Static
 - IPv6 Address:** [Empty text box]
 - Link Local Address:** FE80::2D0:BAFF:FE74:C1D

At the bottom left of the window, there is a checkbox labeled **Top**.

- Now in the **IP Configuration** section, give your laptop an IP address which can be anything from 192.168.0.2-254 (because remember 192.168.0.1 is our gateway).

The screenshot shows the WinBox configuration window for a device named 'Laptop4'. The 'Config' tab is selected, and the 'FastEthernet0' interface is chosen from the left sidebar. The interface settings are as follows:

- Port Status:** ☒ On
- Bandwidth:** ☒ 100 Mbps, ☐ 10 Mbps, ☒ Auto
- Duplex:** ☐ Half Duplex, ☒ Full Duplex, ☒ Auto
- MAC Address:** 00D0:BA74:0C1D
- IP Configuration:**
 - ☐ DHCP
 - ☒ Static
 - IPv4 Address:** 192.168.0.1
 - Subnet Mask:** 255.255.255.0
- IPv6 Configuration:**
 - ☐ Automatic
 - ☒ Static
 - IPv6 Address:** (empty field)
 - Link Local Address:** FE80::2D0:BAFF:FE74:C1D

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

- Notice that when you click enter after entering the IP address, the software will automatically detect your Subnet Mask.
- Now repeat these steps for all the laptops in you network
- Done! You have successfully set up a simple LAN using a Switch

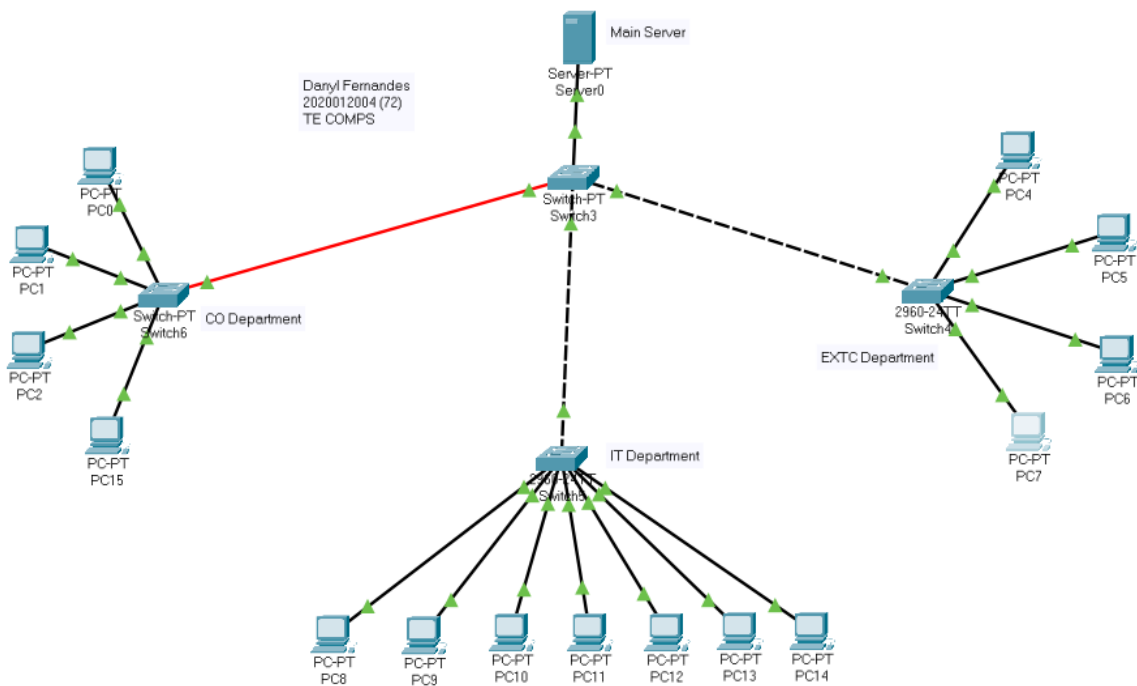
Advantages of a Switch:

- It does not broadcast frames all the time
- It learns the devices in the network and doesn't send data to all
- It is more secure since data goes only to one destination
- It is faster than a Hub
- It can transfer data two ways at the same time

Disadvantages of a Switch:

- It is costlier than a Hub
- There is a lesser possibility of collisions

Network Design Assignment:



My roll no. (72) as the Internal IP address:

PC7

Physical Config Desktop Programming Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Bluetooth

FastEthernet0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0030.A3E1.0D97

IP Configuration

☐ DHCP

☒ Static

IPv4 Address 192.168.0.72

Subnet Mask 255.255.255.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

Link Local Address: FE80::230:A3FF:FEE1:D97

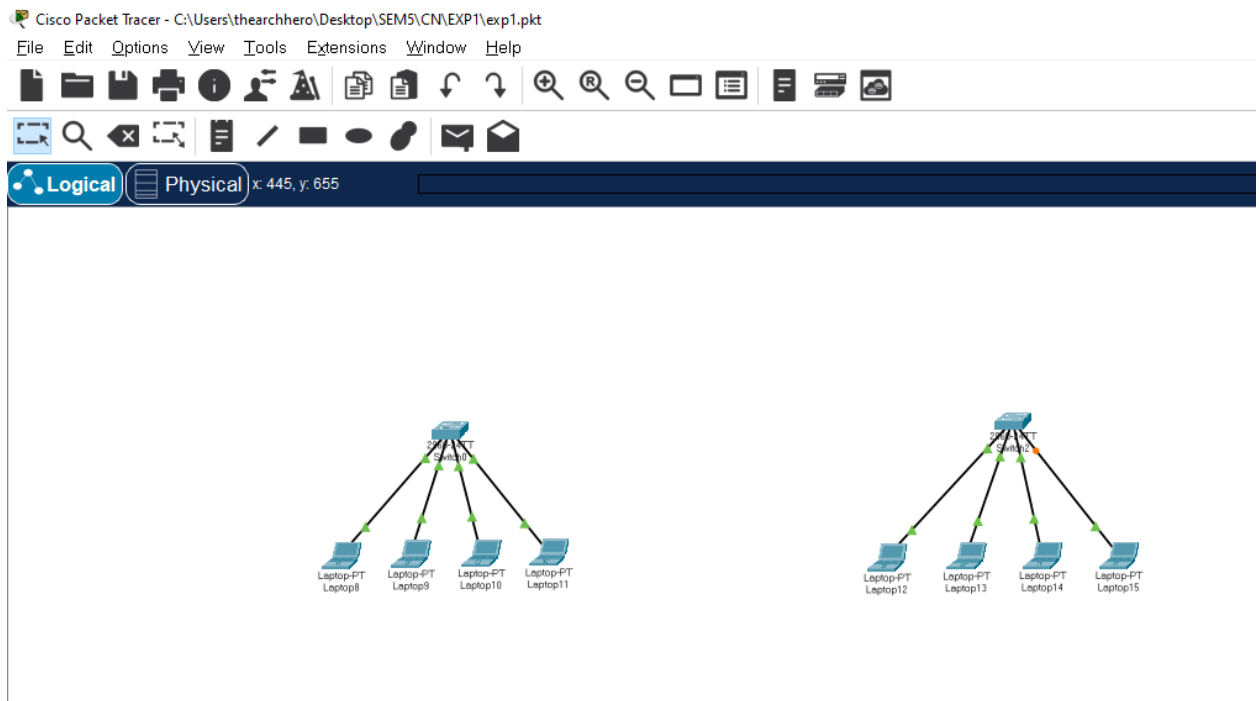
☐ Top

Part 2: Setting up a Router

- Now, we have seen how switches are awesome and how they are smarter than a Hub, but what if we want to connect two switch-connected LANs together?
- We cannot use a switch in this case, since switches work at L2 in the OSI Model and they don't know anything about IP Addresses.
- Let's see how to set up a router to allow communication between two dissimilar networks.

Step 1: Creating two switch-based network

- As shown previously, we will first create two LANs and connect the devices inside them using a switch.



- Next, we'll quickly assign IP Addresses and subnets to them so that the devices know each other on the individual LANs.

- Now every device in LAN 1 has a default gateway as such:

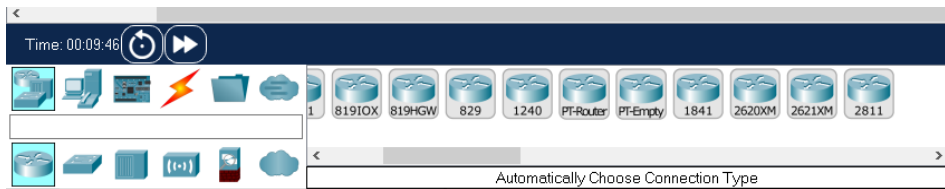
The screenshot shows the configuration window for 'Laptop8'. The 'Config' tab is active. On the left sidebar, the 'INTERFACE' section is expanded, showing 'FastEthernet0' and 'Bluetooth'. The main area displays 'Global Settings' for 'FastEthernet0'. The 'Display Name' is 'Laptop8'. Under 'Gateway/DNS IPv4', the 'Static' radio button is selected, and the 'Default Gateway' is set to '192.168.0.1'. The 'DNS Server' field is empty. Under 'Gateway/DNS IPv6', the 'Static' radio button is also selected, with empty fields for 'Default Gateway' and 'DNS Server'. A 'Top' button is at the bottom left.

- And devices in LAN 2 as such:

The screenshot shows the configuration window for 'Laptop12'. The 'Config' tab is active. On the left sidebar, the 'INTERFACE' section is expanded, showing 'FastEthernet0' and 'Bluetooth'. The main area displays 'Global Settings' for 'FastEthernet0'. The 'Display Name' is 'Laptop12'. Under 'Gateway/DNS IPv4', the 'Static' radio button is selected, and the 'Default Gateway' is set to '10.10.0.1'. The 'DNS Server' field is empty. Under 'Gateway/DNS IPv6', the 'Static' radio button is also selected, with empty fields for 'Default Gateway' and 'DNS Server'. A 'Top' button is at the bottom left.

Step 2: Adding the Router

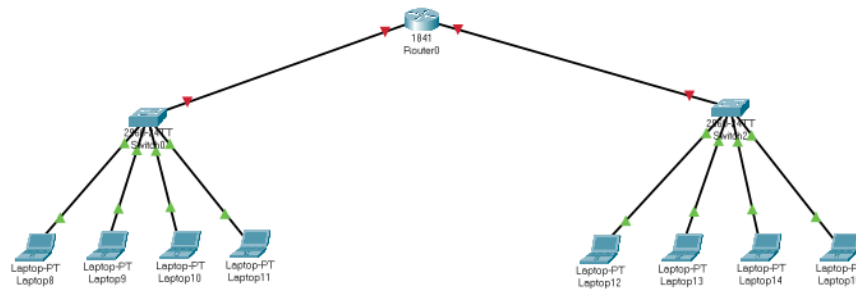
- In the bottom bar, select **Network Devices** and choose the 1841 Router



- Now drag and drop it to your workspace



- Now again click the orange lightning icon and connect the router to the two switches.



Step 3: Setting up the Router

- Click the router and go to the **Config** tab

Router0

Physical Config CLI Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

FastEthernet0/0

FastEthernet0/1

FastEthernet0/0

Port Status ☐ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☒ Half Duplex ☐ Full Duplex ☒ Auto

MAC Address 0002.16D7.8D01

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit 10

Equivalent IOS Commands

Enter configuration commands, one per line. End with CNTL/Z.

```
Router(config)#interface FastEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
```

☐ Top

- In the **Interface** section, you should see two options: FastEthernet0/0 and FastEthernet0/1

INTERFACE

FastEthernet0/0

FastEthernet0/1

- The first port is where our LAN 1 is connected and the second port is where our LAN 2 is connected.
- So the next step is to turn both the ports on and add in the default gateways of the respective ports.
- So click on **FastEthernet0/0** and check the port on checkbox

FastEthernet0/0

Port Status ☒ On

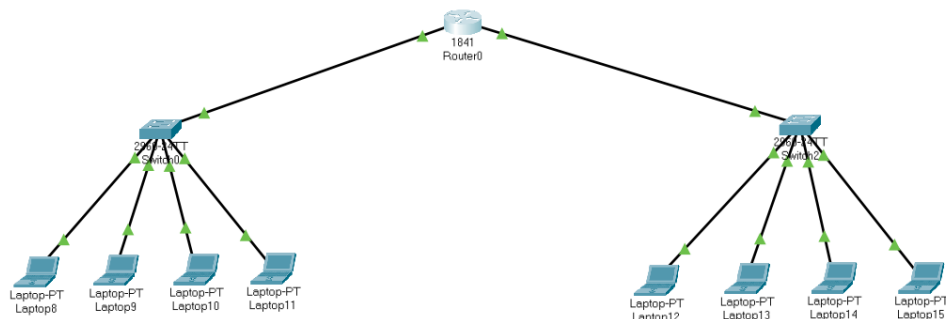
- Now go ahead and add in the default gateway of LAN 1 in the IPv4 Address field

FastEthernet0/0	
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input type="radio"/> Half Duplex <input type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	0002.16D7.8D01
IP Configuration	
IPv4 Address	192.168.0.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

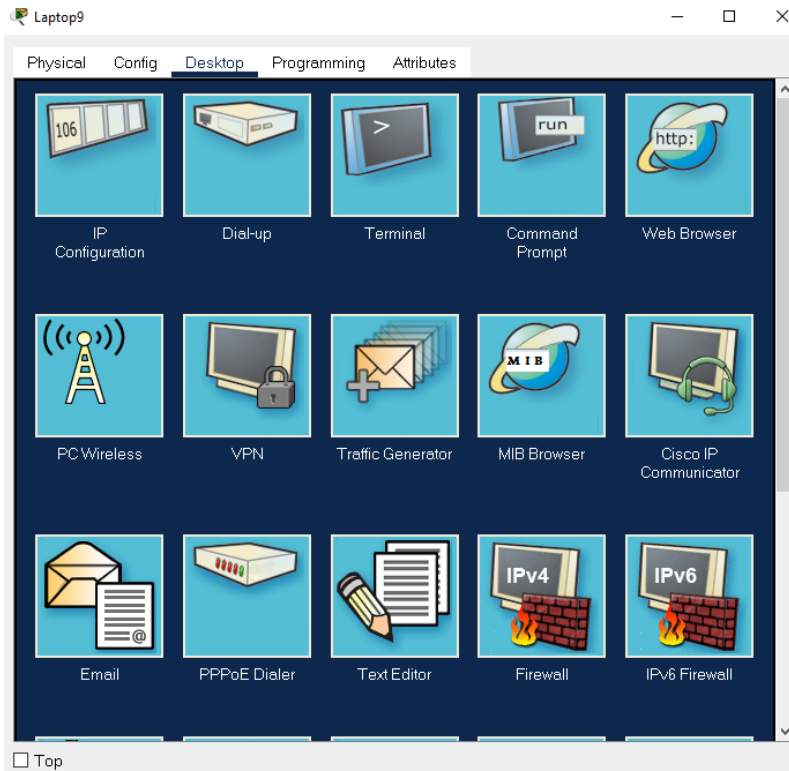
- Do the same for LAN 2

FastEthernet0/1	
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input type="radio"/> Half Duplex <input type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	0002.16D7.8D02
IP Configuration	
IPv4 Address	10.10.0.1
Subnet Mask	255.0.0.0
Tx Ring Limit	10

- Now close this window and you should see that our LAN connections to the router are now green. This is because we started the ports to allow communication between the 2 LANs through the router.



- Now we're done, but let's test our connection by pinging a laptop in LAN 2 from LAN 1.
- Click on any of the laptops from LAN 1 and click the **Desktop** tab



- Now click the command prompt option and type the command "ping 10.10.0.3" and click enter

```

Command Prompt

Packet Tracer PC Command Line 1.0
C:\>ping 10.10.0.3

Pinging 10.10.0.3 with 32 bytes of data:

Request timed out.
Reply from 10.10.0.3: bytes=32 time<1ms TTL=127
Reply from 10.10.0.3: bytes=32 time<1ms TTL=127
Reply from 10.10.0.3: bytes=32 time<1ms TTL=127

Ping statistics for 10.10.0.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25%
    loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>

```

- As you can see clearly we got a reply from the device in LAN 2 and this means that they can communicate with each other through the router.

Questions from ERP:

Description	Device or OSI Layer
This device sends and receives information about the Network layer.	A Router
This layer creates a virtual circuit before transmitting between two end stations	The Transport layer
A layer-3 switch or multilayer switch	The Network Layer
This device uses hardware addresses to filter a network	Switch
Ethernet is defined at these layers	Physical and Data-Link Layers
This layer supports flow control and sequencing.	The Transport Layer
This device can measure the distance to a remote network	The Router
Logical addressing is used at this layer	The Network Layer
Hardware addresses are defined at this layer	The Data-Link Layer
This device creates one big collision domain and one large broadcast domain	The Hub
This device creates many smaller collision domains, but the network is still one large broadcast domain	The Switch
This device can never run full duplex	The Hub
This device breaks up collision domains and broadcast domains	A Router

Conclusion: Hence we studied the design and analysis of Internetworking Devices using the Network simulation tool - Cisco Packet Tracer.