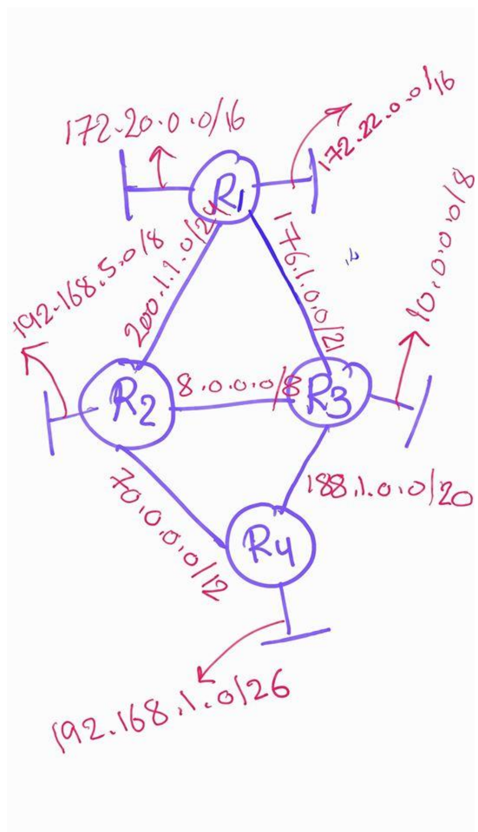
Assigment 1 – From Facebook Group

Design & Simulate the following network using Packet Tracer



Procedure:

First, we collect all of the required devices and put the main design of the network using Cisco Packet Tracer. Noting that the following devices used to simulate this network:

1- Four Cisco routers.
2- Couple of connectors (Copper Straight) and (Serial DTE)
3- End Devices such as Computers, Laptops, etc..
4- Serial Ports (HWIC-2T).

We start by designing the requested shape of the network in the main workspace of the software, then we start labeling everything to make things easier while we’re addressing and programing the devices. The figure below shows the final design shape.

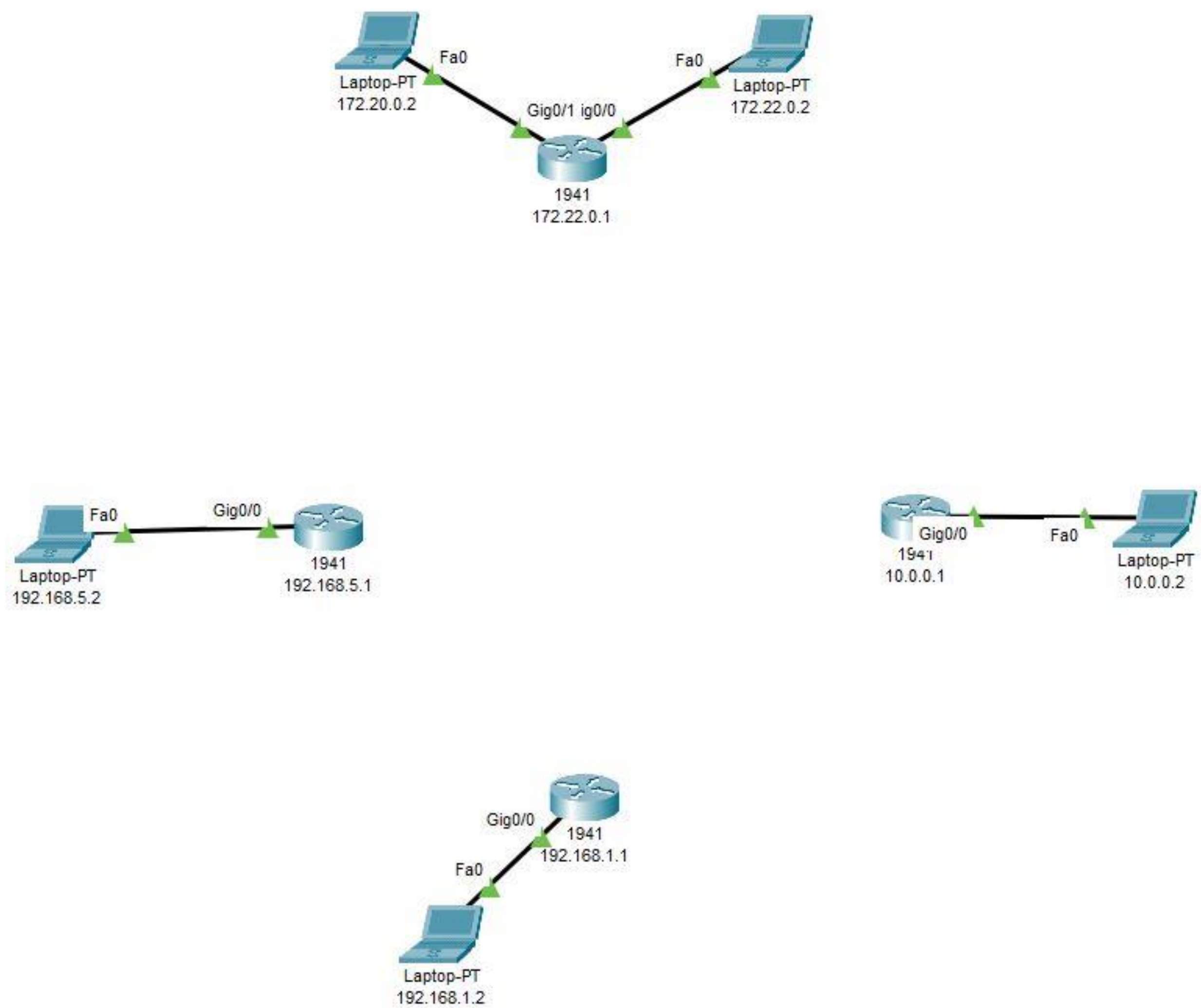


Figure (1)

Next, we will install the serial ports (HWIC-2T) on the routers, noting that Router 2 and 3 requires (2 HWIC) because of the connector’s numbers for each router. Serial ports can be added by:

1- Click on the router.

2- Turn the power off.

3- Drag the HWIC-2T to one of the empty slots in the router.

4- Turn the power on.

The figure below shows the router after installing the serial ports.

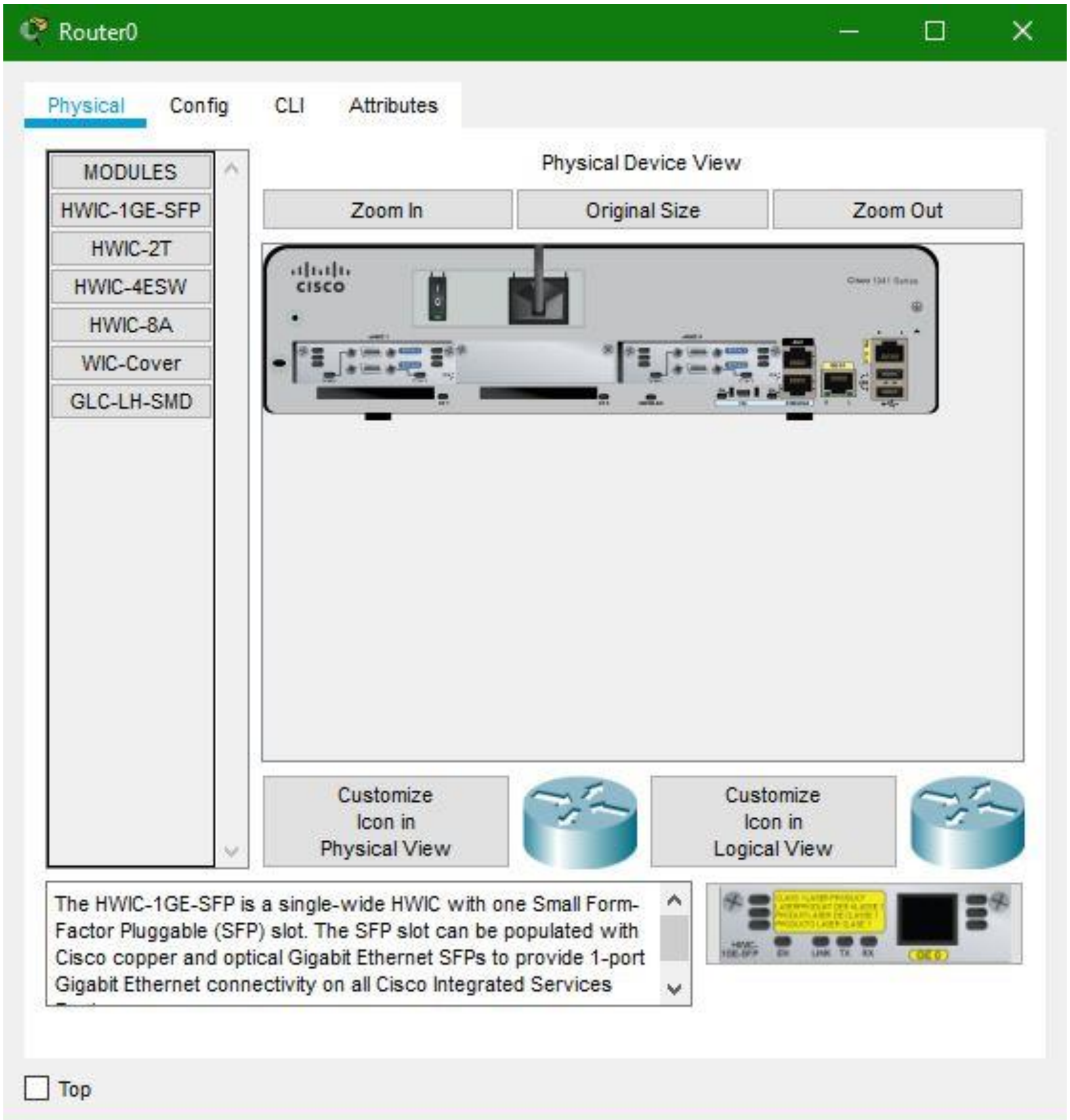


Figure (2)

Now, after installing the serial we will connect the routers to each other using the DTE serial connector. In my design the connection schema was:

- Router 1 => Router 2 through serial 0/0/1 and Vice Versa
- Router 1 => Router 3 through serial 0/0/0 and Vice Versa

- Router 4 => Router 2 through serial 0/0/1. Router 2 => Router 4 using serial 0/0/0
- Router 4 => Router 3 through serial 0/0/0. Router 3 => Router 4 using serial 0/0/1

Secondly, after all the connectors been ready, we start labeling the networks and the devices to make sure we don't mix up things and gets confused. The final shape of the design will look like the figure below.

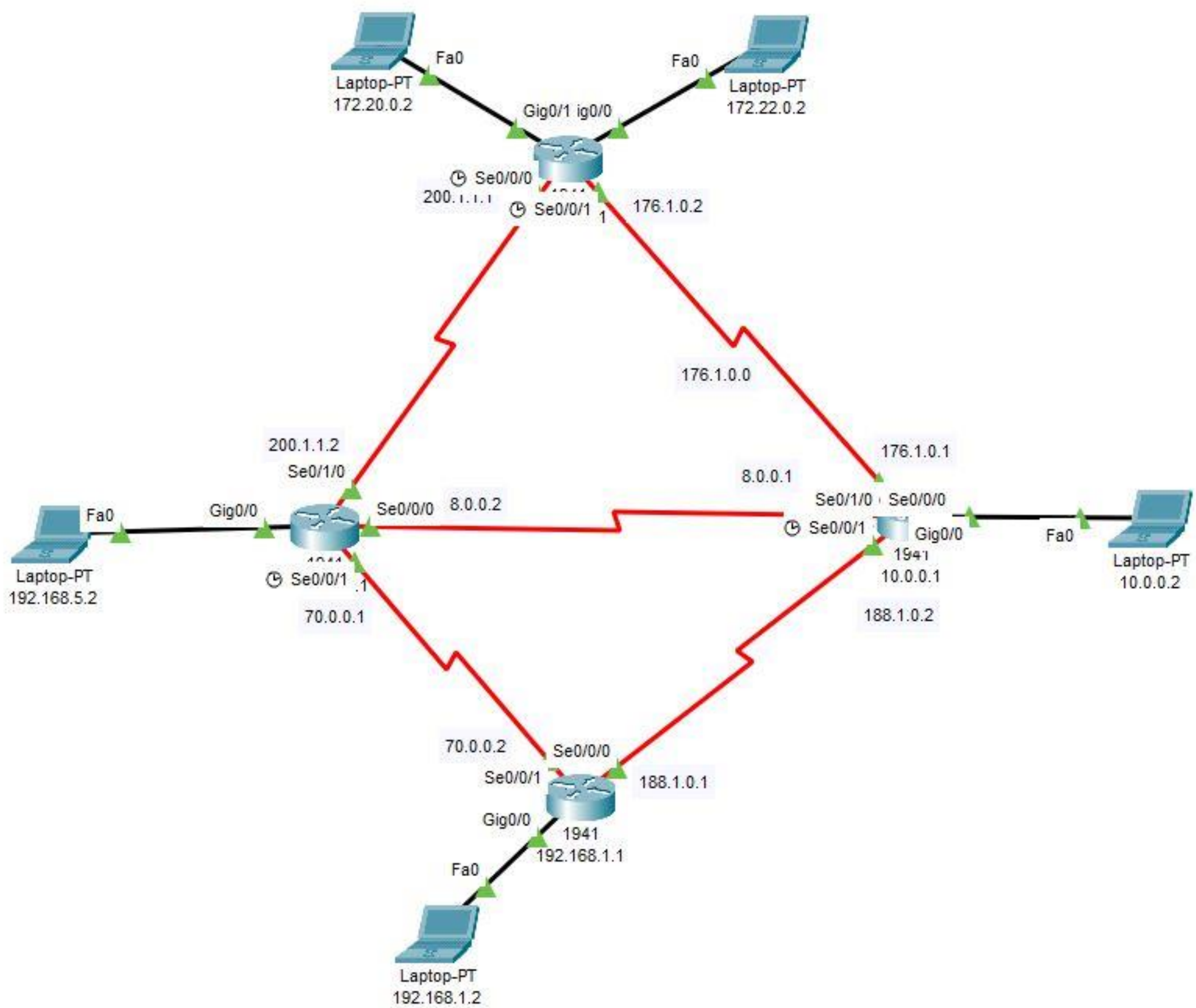


Figure (3)

Once you get the shape shown in figure above, then the design will be completed, and we have to start programing the network devices.

First Part of configuration will be Routers Config

Let's start with Router 1 and its End users, which we want to make it a default gateway for the end users behind it, and we also have to label and address the ports as the assignment requested.

Click on Router 1 > config > Gig0/0:
IP Address: 172.22.0.1
Netmask: 255.255.0.0

Click on Router 1 > config > Gig0/1:
IP Address: 172.20.0.1
Netmask: 255.255.0.0

Then Click the check (ON) icon on the top right corner in bot boxes.

Now, navigate to the Serial 0/0/0 and address the network as:
IP Address: 200.1.1.1
Netmask: 255.255.255.0
You also have to check the (ON) port on the top right corner for all of the used ports in this project.

Then navigate to the Serial 0/0/1 on the right pane of the window and address the following:
IP Address: 176.1.0.2
Netmask: 255.255.0.0

Now we've finished the router 1 config, let's move to router 4 and follow the same steps and address it using:

Gig 0/0:
IP Address: 192.168.1.1
Netmask: 255.255.255.0

Serial 0/0/0:
IP Address: 188.1.0.1
Netmask: 255.255.0.0

Serial 0/0/1:
IP Address: 70.0.0.2
Netmask: 255.0.0.0

Router 4 setting up is almost completed. Now we must configure the both routers in the middle of the design, Routers 2, 3.

Starts with Router 2:

Gib 0/0:
IP: 192.168.5.1
Netmask: 255.255.255.0

Serial 0/0/0:
IP: 8.0.0.2
Netmask: 255.0.0.0

Serial 0/0/1:
IP: 70.0.0.1
Netmask: 255.0.0.0

Serial 0/1/0:
IP: 200.1.1.2
Netmask: 255.255.255.0

Leaving the serial 0/1/1 off.

Now star configuring the Router 3 with the same method by using the following settings:

Gig 0/0:
IP: 10.0.0.1
Netmask: 255.0.0.0

Serial 0/0/0:
IP: 8.0.0.1
Netmask: 255.0.0.0

Serial 0/0/1:
IP: 188.1.0.2
Netmask: 255.255.0.0

Serial 0/1/0:
IP: 176.1.0.1
Netmask: 255.255.0.0

All the routers in the network has been configured now. We have two more steps to make this network running and forwarding all packets between the end devices.

Second Part is configuring the end users to have a static IP instead of DHCP:
each PC will have a static IP from its own router. Will be configuring PC's as the exact same way of routers in respect to same arrange as: Router 1, 4, 2, 3.

PC1 R1:
Click on the PC > Desktop > IP Configuration > Static:
IP: 172.22.0.2
Netmask: 255.255.0.0
Gateway: 172.22.0.1 (The gateway IP must be the router main IP which the PC is connected to).

PC2 R1:
IP: 172.20.0.2
Netmask: 255.255.0.0
Gateway: 172.20.0.1 (The gateway IP must be the router main IP provided by each GigEthernet Port which the PC is connected to).

With the exact same steps:

PC4:
IP: 192.168.1.2
Netmask: 255.255.255.0
Gateway: 192.168.1.1

PC2:
IP: 192.168.5.2
Netmask: 255.255.255.0
Gateway: 192.168.5.1

PC3:
IP: 10.0.0.2
Netmask: 255.0.0.0
Gateway: 10.0.0.1

Next step, programing the routers to forward the packets between each other, this step will take place on each router using the command line instead of using the user interface for each router.

Before we start, we have to make sure all the routers are powered on, once we done powering them on, we start programing them in the same order we did in the previous steps, Router 1,4,2,3.

Click on Router 1 > CLI > Click Enter > Then Type these commands:

en # Gets privilege mode
config t # Access the terminal config mode
ip route 10.0.0.0 255.0.0.0 176.1.0.1 # Forwards packets to Router 3
ip route 192.168.5.0 255.255.255.0 200.1.1.2 # Forwards packets to Router 2
ip route 192.168.1.0 255.255.255.0 176.1.0.1 # Forwards packets to Router 4

Explanation of the routes:
First route: routes the data to the destination (10.0.0.0) which means all of the end users that have (10.0.X.X) can be used to receive data.
The netmask of the destination is 255.0.0.0 since its Class A.
The next value is (176.1.0.1) which is the address of the serial port which the data

arrived through. (Usually it's the serial IP address of the receiving router).

Second route: works as the same way as the previous command: ip router destination_address destination_netmask next_hop

Now let's start programing the rest of the routers:

Router 4:
ip route 10.0.0.0 255.0.0.0 188.1.0.2 # Forwards packets to Router 3
ip route 192.168.5.0 255.255.255.0 70.0.0.1 # forwards packets to Router 2
ip route 172.22.0.0 255.255.0.0 188.1.0.2 # Forwards packets to net 1 in Router 1
ip route 172.20.0.0 255.255.0.0 70.0.0.1 # forwards packets to net2 in Router 1

Router 2:
This router has 3 connectors which means it requires 3 ip routes:
ip route 172.20.0.0 255.255.0.0 200.1.1.1 # Forwards packets to net 1 in Router 1
ip route 172.22.0.0 255.255.0.0 200.1.1.1 # Forwards packets to net 2 in Router 1
ip route 10.0.0.0 255.0.0.0 8.0.0.1 # Forwards packets to Router 3
ip route 192.168.1.0 255.255.255.0 70.0.0.2 # Forwards packets to Router 4

Router 3:
ip route 172.20.0.0 255.255.0.0 176.1.0.2 # Forwards packets to net1 in Router 1
ip route 172.22.0.0 255.255.0.0 176.1.0.2 # Forwards packets to net2 in Router 1
ip route 192.168.5.0 255.255.255.0 8.0.0.2 # Forwards packets to Router 2
ip route 192.168.1.0 255.255.255.0 188.1.0.1 # Forwards packets to Router 4

We've finished programing now. Now the network should be working without any problems. To check or test the results, we can do a ping command from one PC to another to make sure if it replies back or now.

Let's try to ping from PC2 to PC4 and check what we get:

Click on PC2 > Desktop > Command Prompt, then ping the PC4 (10.0.0.2): ping 10.0.0.2

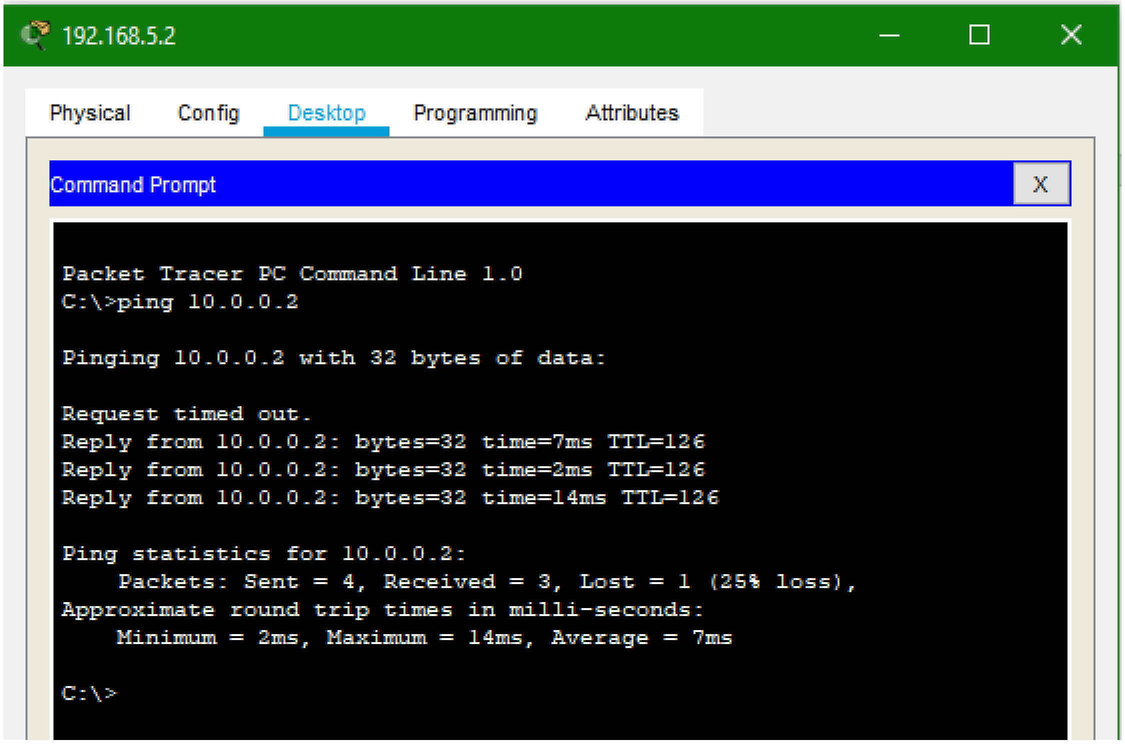


Figure (4)

As we can see in the figure above, the data has been successfully forwarded through Router 2, 4.

Now let’s try to simulate the network by sending a message between all of the devices:

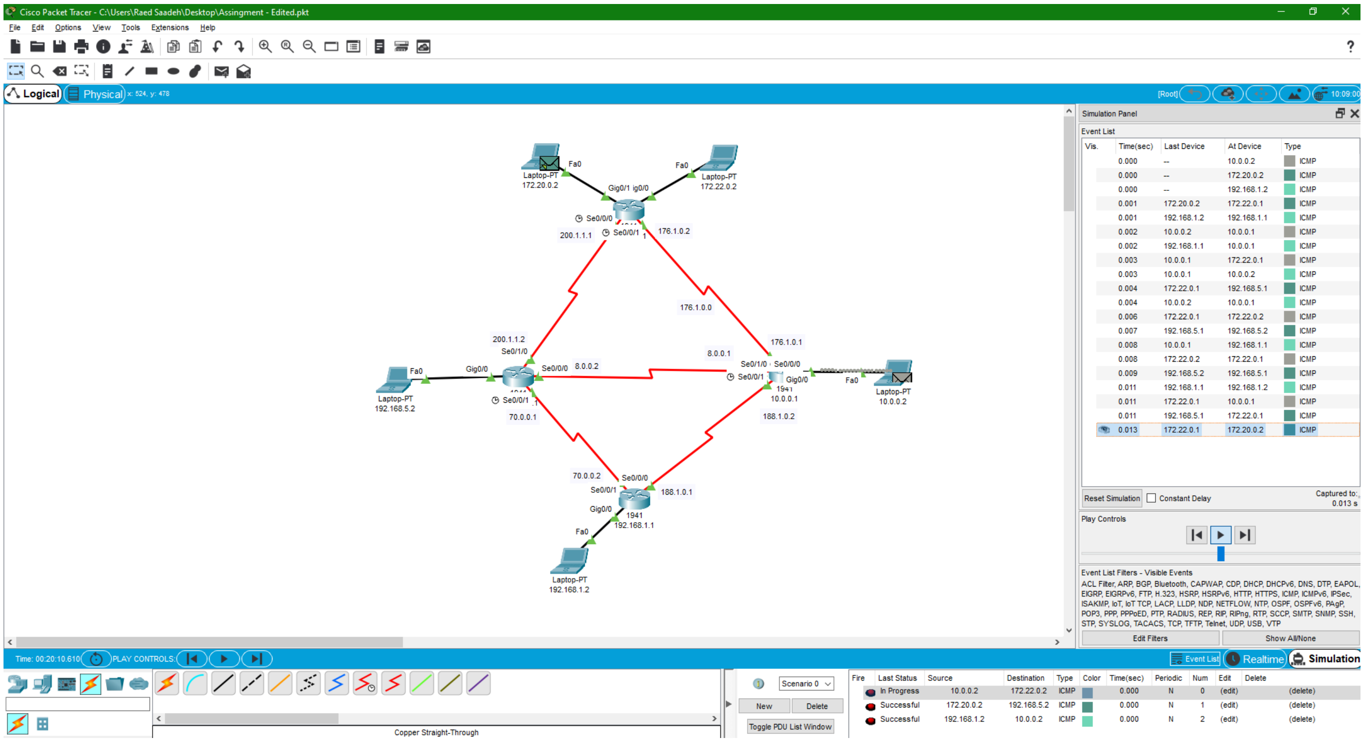


Figure (5)

As we can see in the previous figure, the data has been successfully simulated between the all of the routers.

The data can be sent from any device to another without issues. Let’s try to ping any device from any device:

C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time=14ms TTL=125
Reply from 192.168.1.2: bytes=32 time=2ms TTL=125
Reply from 192.168.1.2: bytes=32 time=10ms TTL=125
Reply from 192.168.1.2: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.1.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 14ms, Average = 7ms

C:\>ping 192.168.5.2

Pinging 192.168.5.2 with 32 bytes of data:

Reply from 192.168.5.2: bytes=32 time=19ms TTL=126
Reply from 192.168.5.2: bytes=32 time=1ms TTL=126
Reply from 192.168.5.2: bytes=32 time=1ms TTL=126
Reply from 192.168.5.2: bytes=32 time=6ms TTL=126

Ping statistics for 192.168.5.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 19ms, Average = 6ms

C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time=12ms TTL=126
Reply from 192.168.1.2: bytes=32 time=2ms TTL=126
Reply from 192.168.1.2: bytes=32 time=11ms TTL=126
Reply from 192.168.1.2: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.1.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 12ms, Average = 6ms

C:\>ping 192.168.5.2

Pinging 192.168.5.2 with 32 bytes of data:

Reply from 192.168.5.2: bytes=32 time=14ms TTL=126
Reply from 192.168.5.2: bytes=32 time=1ms TTL=126
Reply from 192.168.5.2: bytes=32 time=1ms TTL=126
Reply from 192.168.5.2: bytes=32 time=9ms TTL=126

Ping statistics for 192.168.5.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 14ms, Average = 6ms