

# CS 361

# Computer

# Networks Lab

## Assignment 6

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Date – 26/10/2023

## Questions:

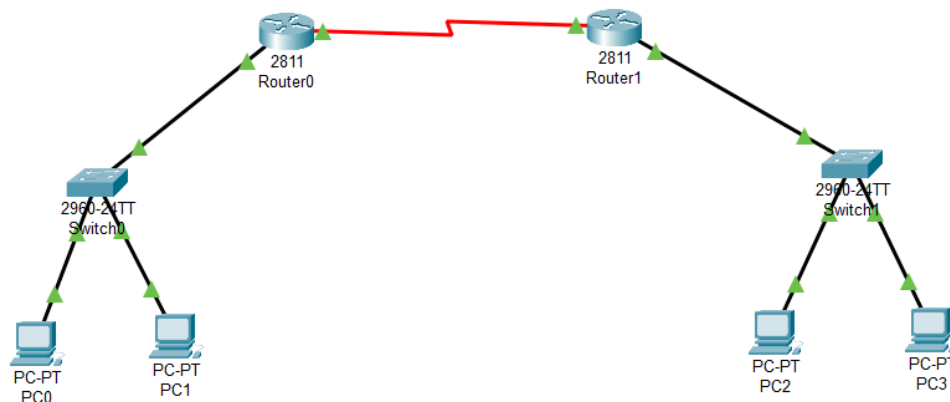
### 1. Make a network and transfer messages from one PC to another as demonstrated in the lab.

The objective is to have two different networks, and do router configurations, such that the end devices can communicate with each other, as well as with the routers.

Components used:



Connection diagram:



For Connections: Copper Straight Through Wire used for connection PCs with switch, and switches with routers, and serial DCE wires used for connecting routers with each other.

Setting up PC IPV4 and default gateway for all the PCs: (PC0 and PC2 configurations showed as an example of PCs connected to the separate networks.

PC0

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 10.10.10.1

Subnet Mask 255.0.0.0

Default Gateway 10.10.10.3

DNS Server 0.0.0.0

PC2

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 20.20.20.1

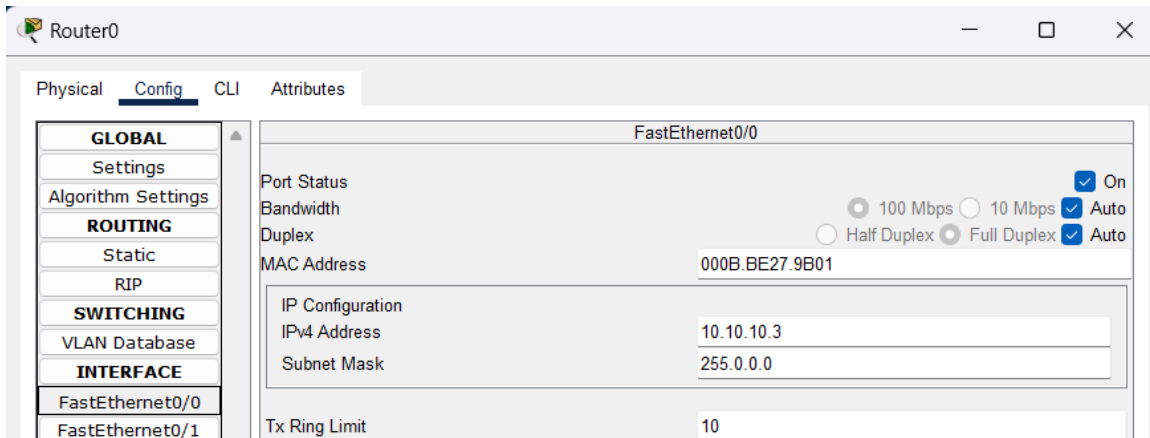
Subnet Mask 255.0.0.0

Default Gateway 20.20.20.3

DNS Server 0.0.0.0

Setting up both router's Fast-Ethernet ports to serve as a gateway:

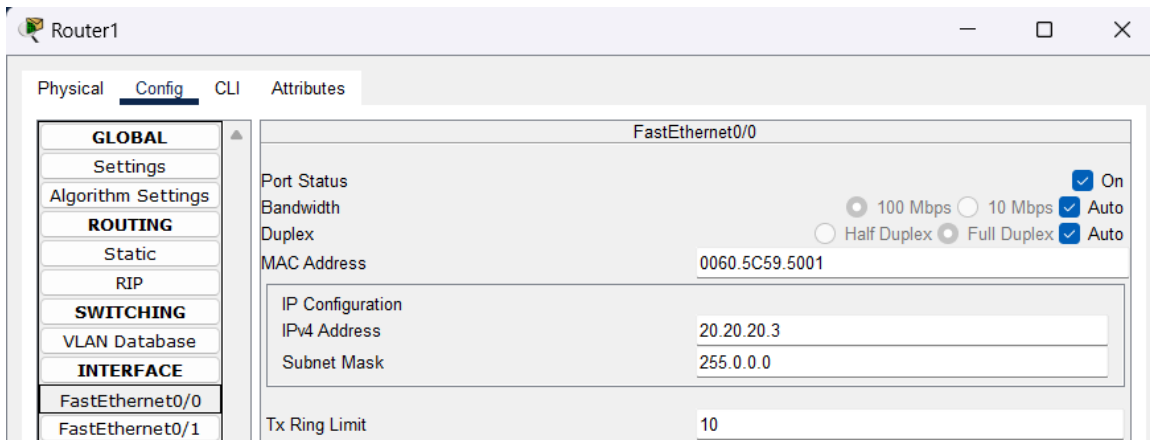
Router 0:



The screenshot shows the configuration window for Router0. The 'Config' tab is selected, and the 'FastEthernet0/0' interface is chosen from the left sidebar. The configuration details for FastEthernet0/0 are as follows:

Parameter	Value
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 checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	000B.BE27.9B01
IP Configuration	
IPv4 Address	10.10.10.3
Subnet Mask	255.0.0.0
Tx Ring Limit	10

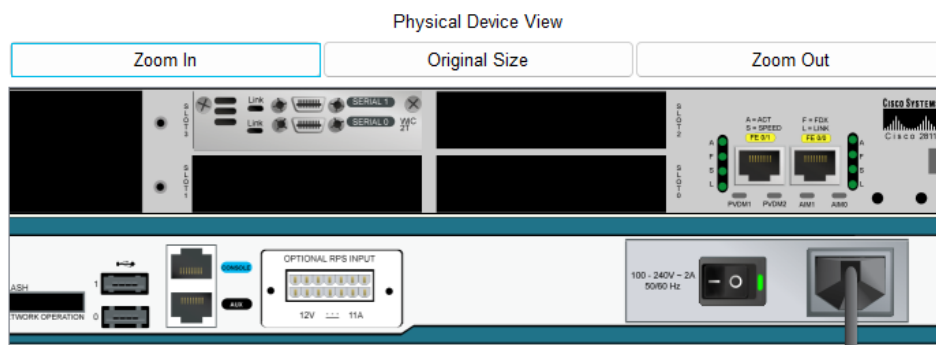
Router 1:



The screenshot shows the configuration window for Router1. The 'Config' tab is selected, and the 'FastEthernet0/0' interface is chosen from the left sidebar. The configuration details for FastEthernet0/0 are as follows:

Parameter	Value
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 checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	0060.5C59.5001
IP Configuration	
IPv4 Address	20.20.20.3
Subnet Mask	255.0.0.0
Tx Ring Limit	10

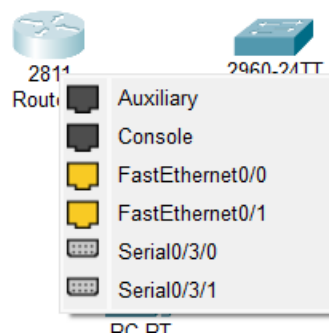
As a next step we need to connect the routers with each other. For that we need to add the WIC-2T module in both the routers. Four slots are available, and any one can be used for the same.



Module should be added only when the router is switched off, done by clicking on the switch button. The module contains 2 serial ports which will be used for connecting.

INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/3/0
Serial0/3/1

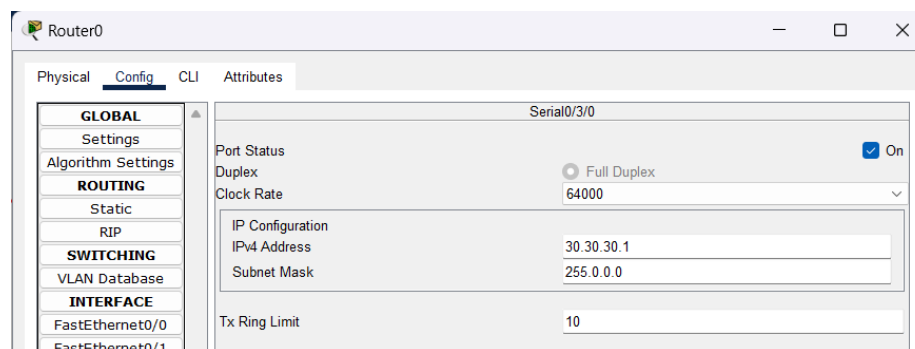
Next, the serial DCE wires is used to connect the two routers. The port needs to be selected as per user choice, where the connection is to be made.

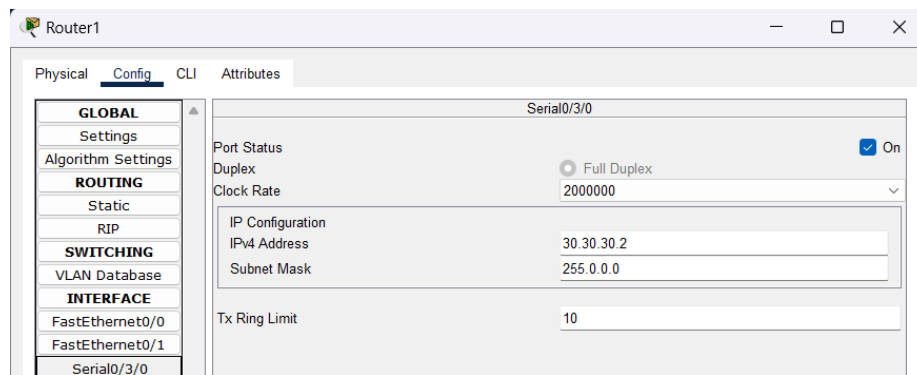


Connection done:



The green flags are achieved after giving an IPV4 to the serial ports, along with providing the specified details.





After this, a few commands are to be typed in the CLI (Command Line Interface) of both the routers.

From Router 1 (IPV4: 30.30.30.1) to connect to Router 2 (IPV4: 30.30.30.2)

```
Router(config)#interface Serial0/3/0
Router(config-if)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 30.30.30.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

From Router 2 (IPV4: 30.30.30.2) to connect to Router 1 (IPV4: 30.30.30.1)

```
Router(config-if)#exit
Router(config)#interface Serial0/3/0
Router(config-if)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 30.30.30.1
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

After this, the connections are ready to be experimented upon.

All message passing is successfully done.

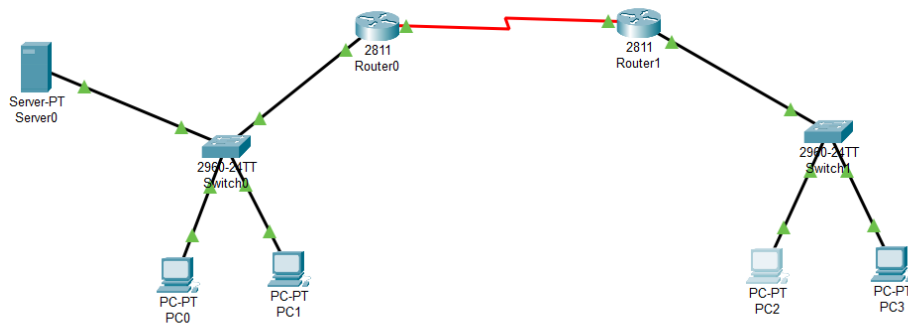
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	Router0	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC0	Router1	ICMP		0.000	N	3	(edit)	(delete)

**2. Connect a server to the network designed in the previous problem and transfer mail between pcs or open a web page.**

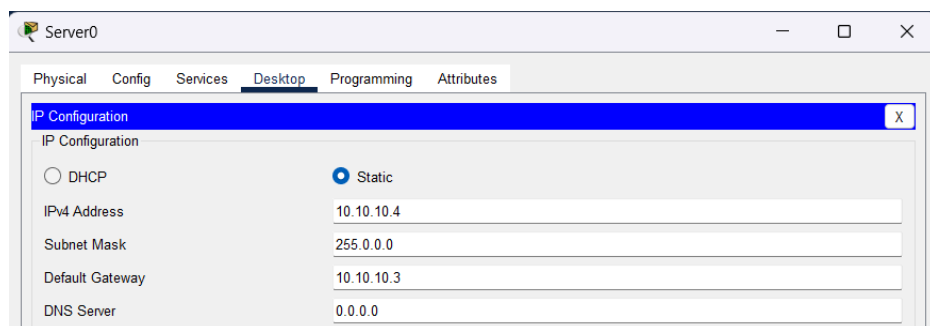
Components used:

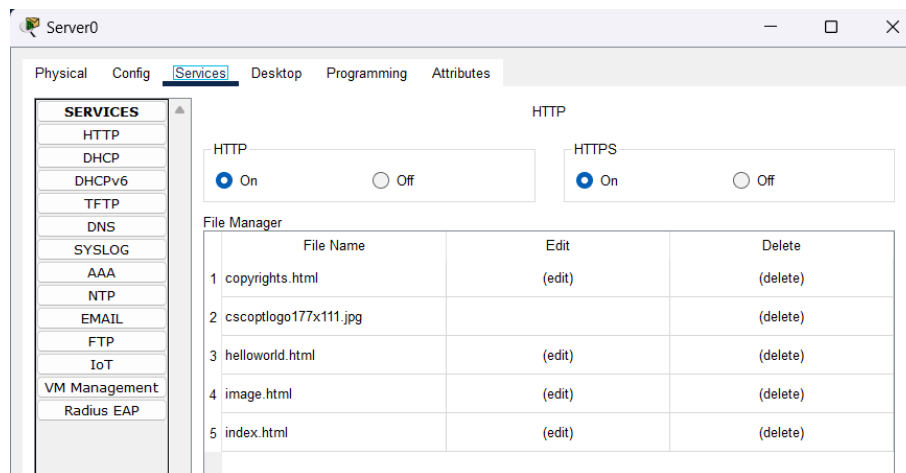


Connection Diagram after connecting server:

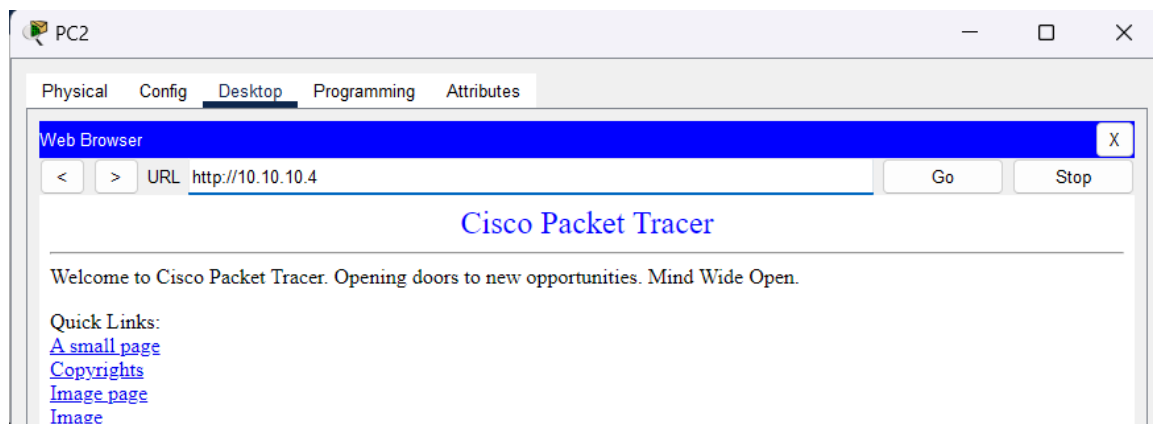


Setting server configurations:



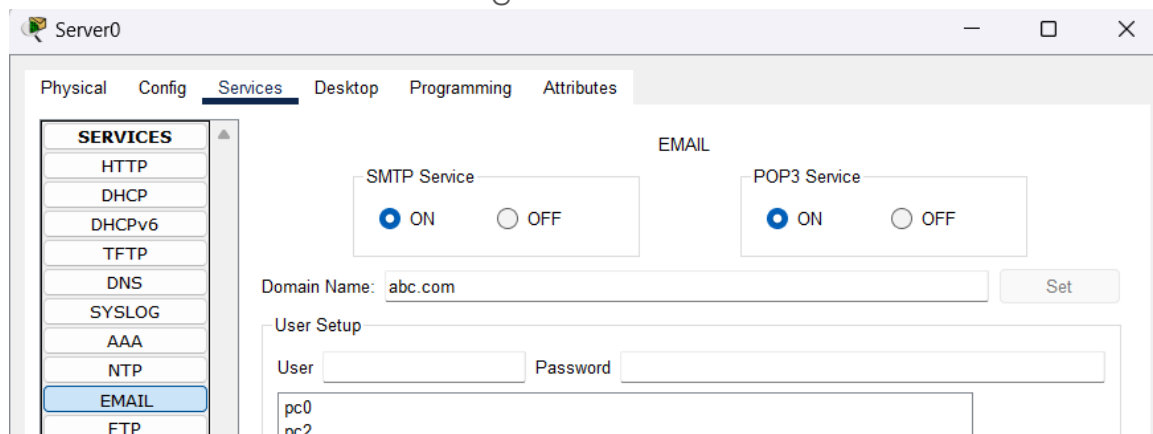


We can see from the connection diagram that the server is connected to the router0 side of the connection diagram. So, we will try to access the webpage from PC2 which is at a different network.



### For Sending email:

Email services need to be configured in the server:





PC0 and PC2 are in separate networks. Their mails need to be configured as well.

The image shows two side-by-side screenshots of the 'Configure Mail' dialog boxes for PC0 and PC2. Both windows have tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes'. The 'Configure Mail' tab is active in both. The fields are as follows:

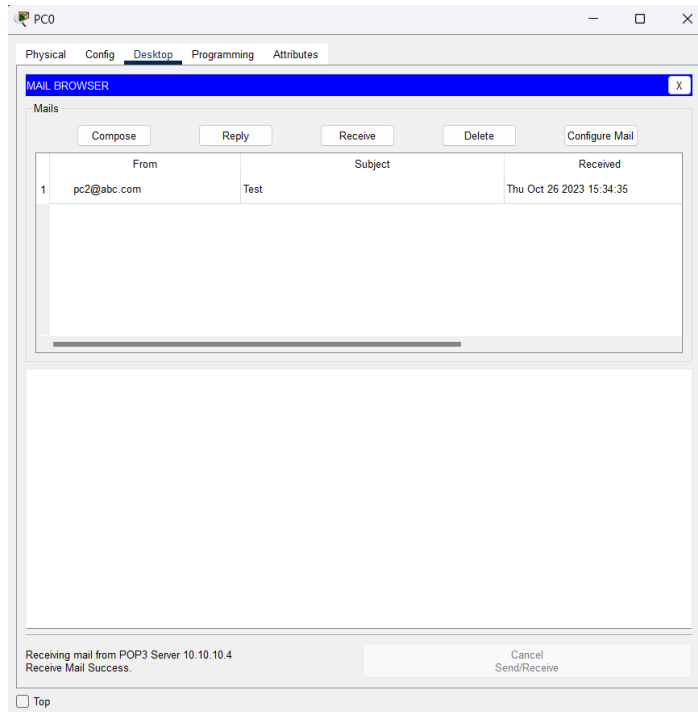
Field	PC0 Value	PC2 Value
User Information		
Your Name	pc0	pc2
Email Address	pc0@abc.com	pc2@abc.com
Server Information		
Incoming Mail Server	10.10.10.4	10.10.10.4
Outgoing Mail Server	10.10.10.4	10.10.10.4
Logon Information		
User Name	pc0	pc2
Password	****	****

At the bottom of each window are buttons: 'Save', 'Remove', 'Clear', and 'Reset'.

Sending mail from PC2 to PC0

The image shows a screenshot of the 'MAIL BROWSER' window on PC2. The window has tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes'. The 'MAIL BROWSER' tab is active. The 'Mails' section contains buttons for 'Compose', 'Reply', 'Receive', 'Delete', and 'Configure Mail'. Below these buttons is a table with columns 'From', 'Subject', and 'Received'. The table is currently empty. At the bottom of the window, there is a status bar that reads: 'Sending mail to pc0@abc.com , with subject : Test .. Mail Server: 10.10.10.4 Send Success.' To the right of the status bar are buttons for 'Cancel' and 'Send/Receive'. A 'Top' button is located at the bottom left of the window.

Mail successfully received by PC0 from PC2



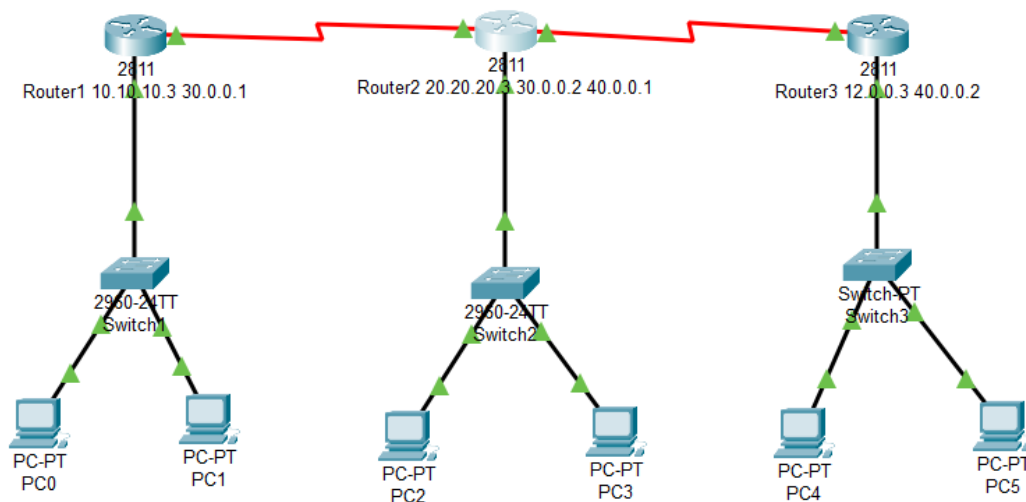
Both webpage access, and email sending was successful.

### 3. Create a complex network using three or more routers and transfer messages from one network to another.

Components used:



Connection Diagram:



From the diagram, we can see that each of the routers have been given an IPV4 for the Fast-Ethernet, that serves as a default gateway for the end devices or the PCs. The other important thing to notice is that IPV4 is also assigned to the Serial ports of the WIC-2T module.

Serial Port configuration for Router 1.

Router1 10.10.10.3 30.0.0.1

Physical **Config** CLI Attributes

**GLOBAL**

- Settings
- Algorithm Settings
- ROUTING**
- Static
- RIP
- SWITCHING**
- VLAN Database
- INTERFACE**

**Serial0/0/0**

Port Status ☒ On

Duplex ☐ Full Duplex

Clock Rate 9600

IP Configuration

IPv4 Address 30.0.0.1

Subnet Mask 255.0.0.0

Serial Port configuration for Router 2. Note both the serial ports of the WIC-2T module have been used, due to double connections.

Router2 20.20.20.3 30.0.0.2 40.0.0.1

Physical **Config** CLI Attributes

**GLOBAL**

- Settings
- Algorithm Settings
- ROUTING**
- Static
- RIP
- SWITCHING**
- VLAN Database
- INTERFACE**

**Serial0/0/0**

Port Status ☒ On

Duplex ☐ Full Duplex

Clock Rate 9600

IP Configuration

IPv4 Address 30.0.0.2

Subnet Mask 255.0.0.0

Router2 20.20.20.3 30.0.0.2 40.0.0.1

Physical **Config** CLI Attributes

**GLOBAL**

- Settings
- Algorithm Settings
- ROUTING**
- Static
- RIP
- SWITCHING**
- VLAN Database
- INTERFACE**

**Serial0/0/1**

Port Status ☒ On

Duplex ☐ Full Duplex

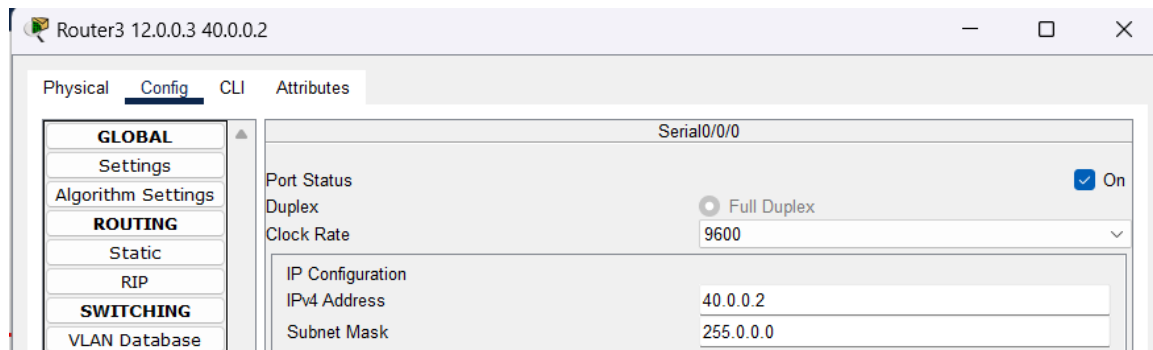
Clock Rate 9600

IP Configuration

IPv4 Address 40.0.0.1

Subnet Mask 255.0.0.0

## Serial Port configuration for Router 3.



After this command is given to the respective CLIs of the routers, to recognize the routers that it needs to connect to.

Note the IPV4s are:

- Router 1: Serial 0/0/0 – 30.0.0.1
- Router 1: Serial 0/0/0 – 30.0.0.2 & Serial 0/0/1 – 40.0.0.1
- Router 1: Serial 0/0/0 – 40.0.0.2
- 

Router 1 needs to recognize Router 2, so command is:

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Serial0/0/0
Router(config-if)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 30.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Router 2 needs to recognize both Router 1 & Router 3, so command is:

```
Router(config)#interface Serial0/0/0
Router(config-if)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 30.0.0.1
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console







Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Serial0/0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/1
Router(config-if)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 40.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Router 2 needs to recognize Router 3, so command is:























```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Serial0/0/0
Router(config-if)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 40.0.0.1
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

## Observations:

Sending msg from PC0 to all routers:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Router1 10.10.10.3 30.0.0.1	ICMP		0.000	N	8	(edit)	(delete)
	Successful	PC0	Router2 20.20.20.3 30.0.0.2 40...	ICMP		0.000	N	9	(edit)	(delete)
	Successful	PC0	Router3 12.0.0.3 40.0.0.2	ICMP		0.000	N	10	(edit)	(delete)

Sending msg from PC0 to different PCs in different networks:

	Successful	PC1	PC4	ICMP		0.000	N	13	(edit)	(delete)
	Successful	PC5	PC0	ICMP		0.000	N	14	(edit)	(delete)
	Successful	PC4	PC2	ICMP		0.000	N	15	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	16	(edit)	(delete)
	Successful	PC0	PC3	ICMP		0.000	N	17	(edit)	(delete)
	Successful	PC2	PC1	ICMP		0.000	N	18	(edit)	(delete)
	Successful	PC0	PC5	ICMP		0.000	N	19	(edit)	(delete)
	Successful	PC4	PC2	ICMP		0.000	N	20	(edit)	(delete)
	Successful	PC3	PC4	ICMP		0.000	N	21	(edit)	(delete)
	Successful	PC1	PC4	ICMP		0.000	N	22	(edit)	(delete)
	Successful	PC2	PC1	ICMP		0.000	N	23	(edit)	(delete)

Since connections are successful everywhere, the connection has been established successfully, between all three routers.