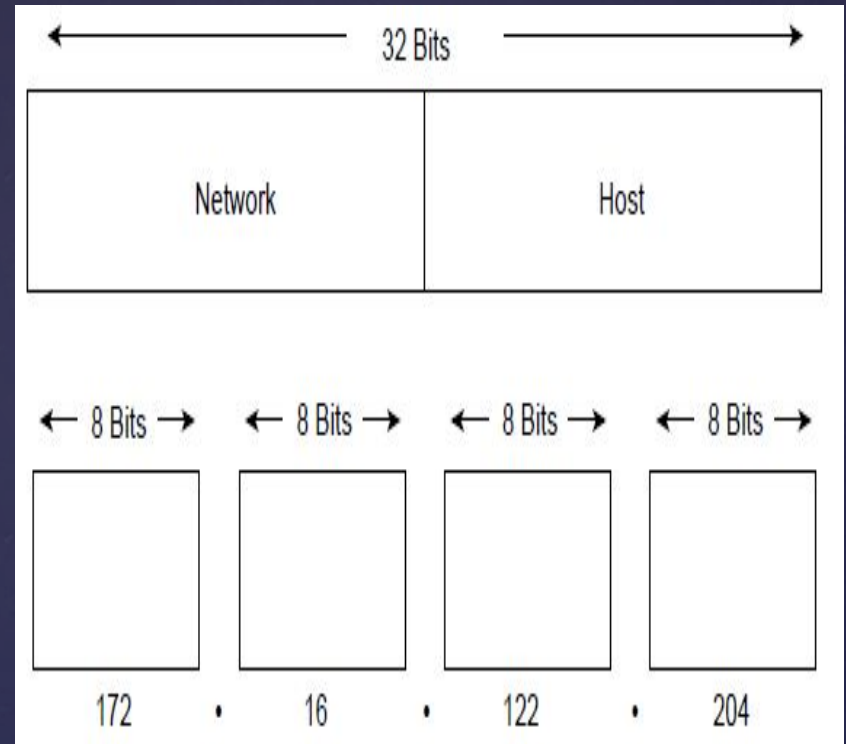


# SUBNETTING

{

# IP Address Format

- The **32-bit** IP address is grouped **eight bits** at a time, separated by dots, and represented in decimal format.
- Each bit in the octet has a binary weight (128, 64, 32, 16, 8, 4, 2, 1).
- The minimum value for an **octet** is **0**, and the maximum value for an **octet** is **255**.



IP addressing supports five different address classes: A, B, C, D, and E. Only classes A, B, and C are available for commercial use

IP Address Class	Format	Purpose	Address Range	No. Bits	
				Network/Host	Max. Hosts
A	N.H.H.H	Few large organizations	1.0.0.0 to 126.0.0.0	7/24	16,777,214 ( $2^{24} - 2$ )
B	N.N.H.H	Medium-size organizations	128.1.0.0 to 191.254.0.0	14/16	65,534 ( $2^{16} - 2$ )
C	N.N.N.H	Relatively small organizations	192.0.1.0 to 223.255.254.0	21/8	254 ( $2^8 - 2$ )
D	N/A	Multicast groups	224.0.0.0 to 239.255.255.255	N/A (not for commercial use)	N/A
E	N/A	Experimental	240.0.0.0 to 254.255.255.255	N/A	N/A

N = Network number, H = Host number.

One address is reserved for the broadcast address, and one address is reserved for the network.

- IP networks can be divided into smaller networks called **subnetworks** (or subnets).

- **FOR EXAMPLE**

172.16.1.0, 172.16.2.0, 172.16.3.0, and 172.16.4.0 are all subnets within network 171.16.0.0. (All 0s in the host portion of an address specifies the entire network.)

# Packet Tracer Tutorial

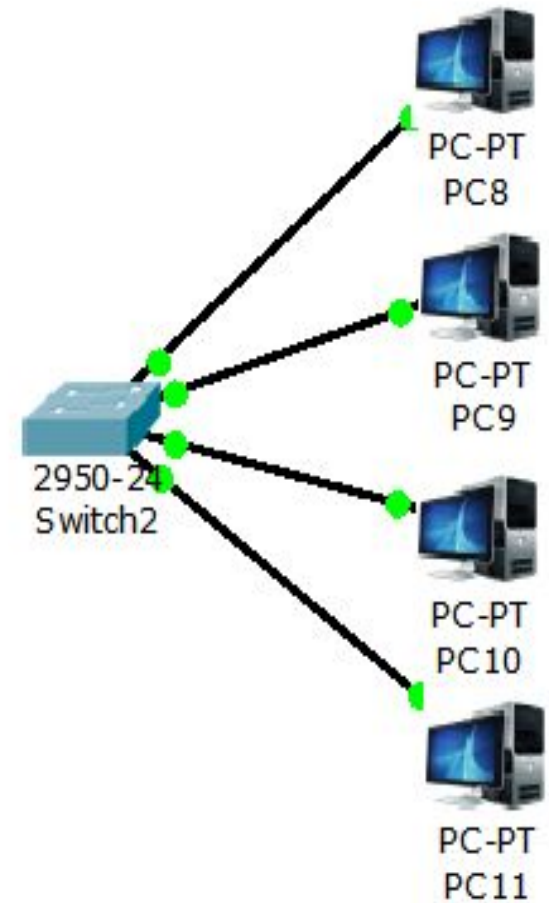
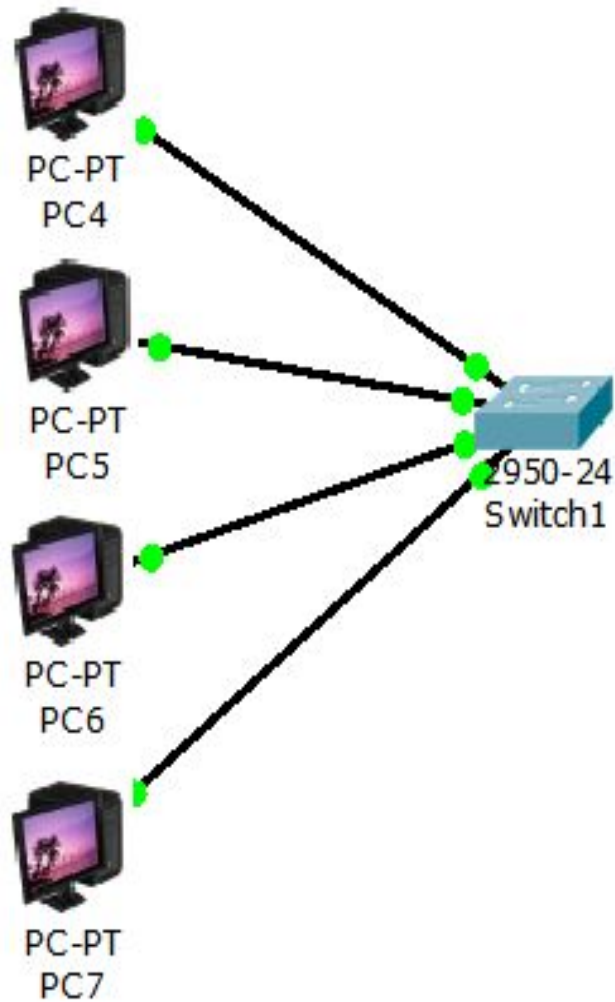
## {



Take 4 pc's each side that will be connected by 2 switches 2950-24

The screenshot displays the Cisco Packet Tracer application window. The title bar reads "Cisco Packet Tracer". The menu bar includes "File", "Edit", "Options", "View", "Tools", "Extensions", and "Help". The toolbar contains various icons for file operations, navigation, and simulation. The main workspace is titled "Logical [Root]" and shows a network topology. On the left, four "PC-PT" devices are stacked vertically, labeled PC4, PC5, PC6, and PC7. In the center, two "2950-24" switches are positioned, labeled Switch1 and Switch2. On the right, four "PC-PT" devices are stacked vertically, labeled PC8, PC9, PC10, and PC11. The bottom status bar shows "Time: 00:12:15" and "Power Cycle Devices". The bottom-left pane is titled "End Devices" and shows a list of device types: Generic, Laptop, Generic, Generic, IPPhone, VoIP Device, and Phone. The bottom-right pane is titled "Realtime" and shows a table with columns: "Fire", "Last Status", "Source", "Destination", "Type", and "Color". The table is currently empty. The "Scenario 0" dropdown menu is visible, along with "New" and "Delete" buttons, and a "Toggle PDU List Window" button.

Connect All of them With copper straight through cable



# Assigning IP

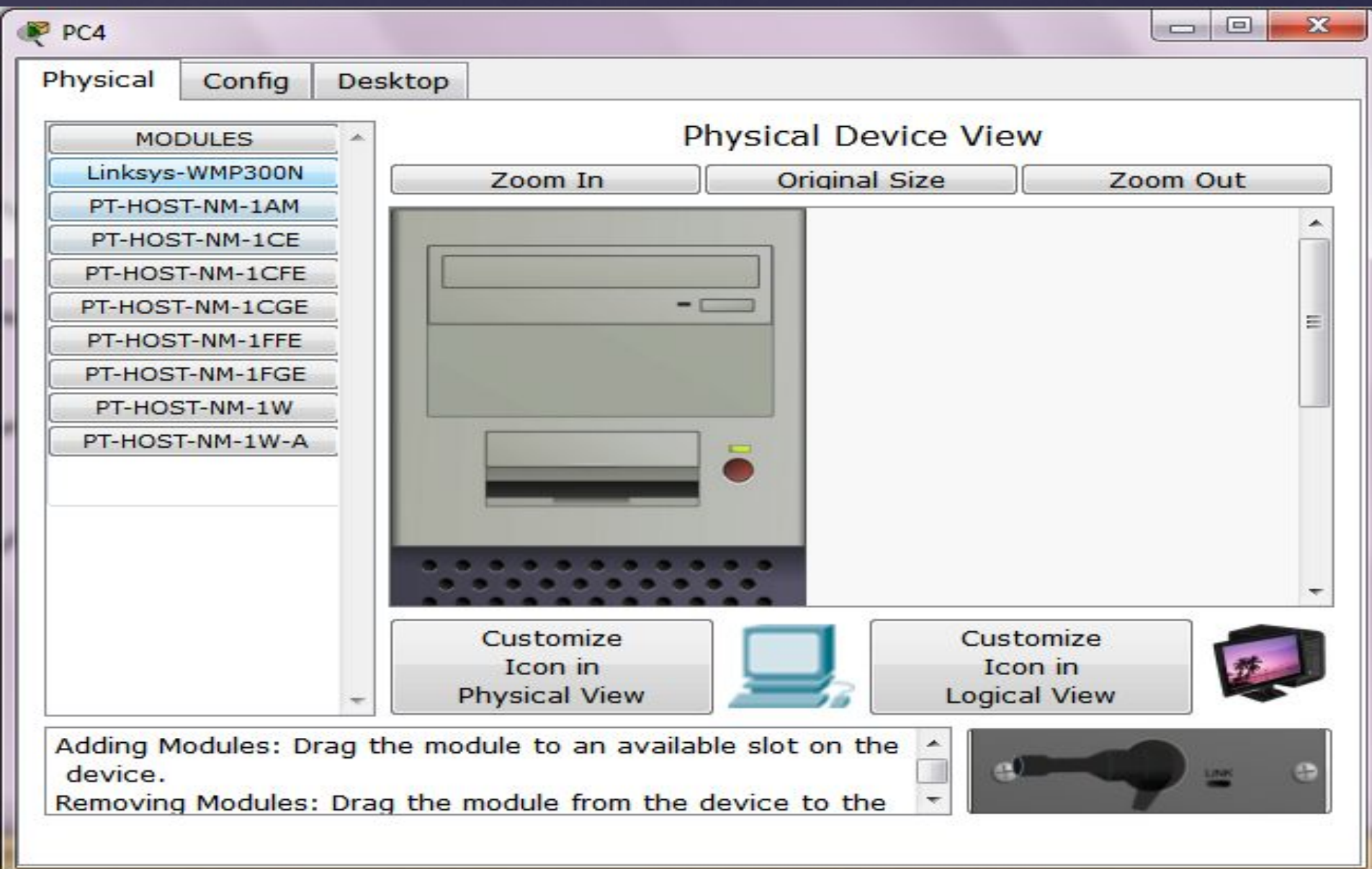
10.0.0.1	To	10.255.255.254
172.16.0.1	To	172.31.255.254
192.168.0.1	To	192.168.255.254

If 2 computers want to communicate in a network they must  
have same type of address

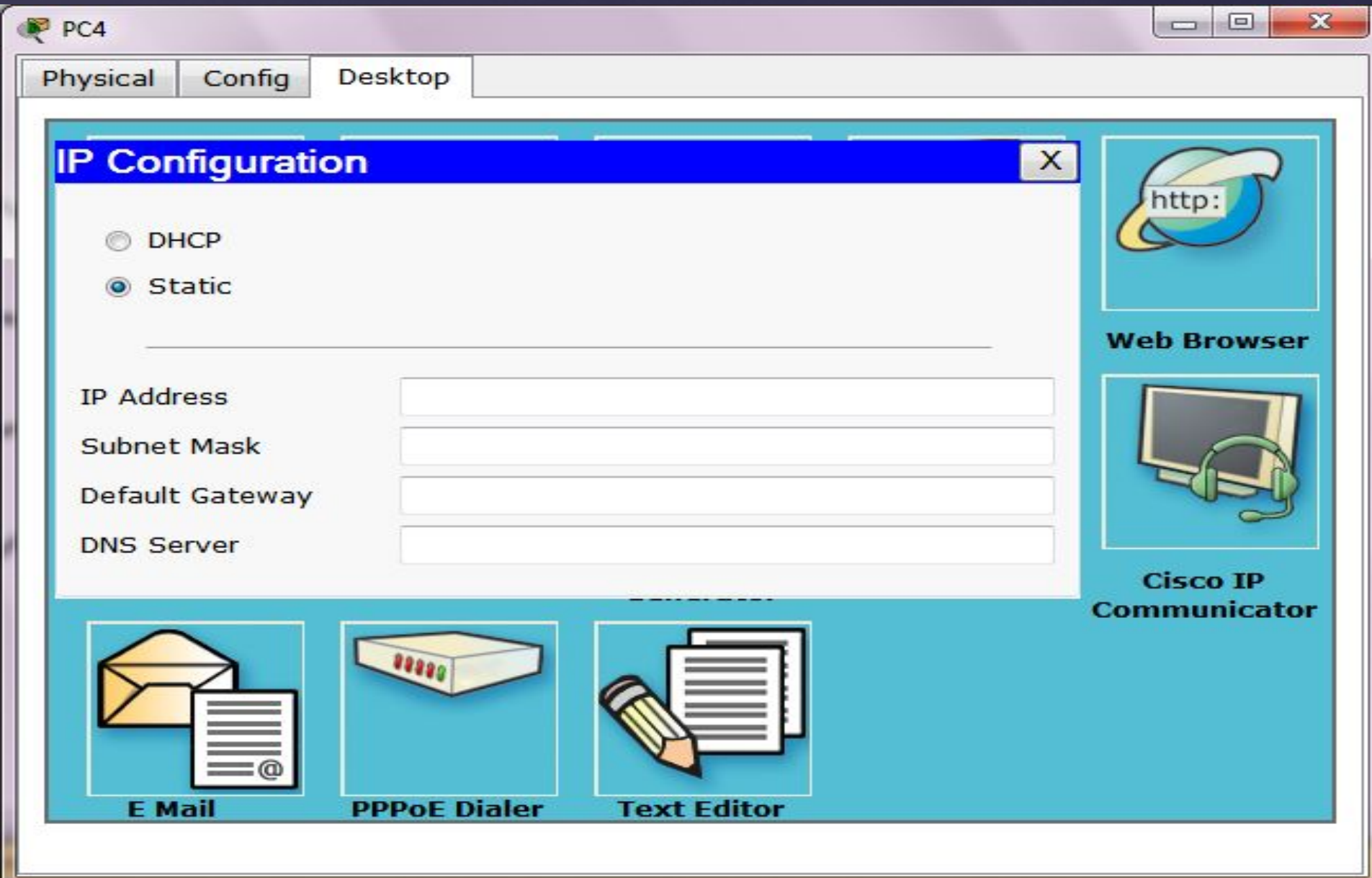


Assign ip To pc's in 1<sup>st</sup>  
network

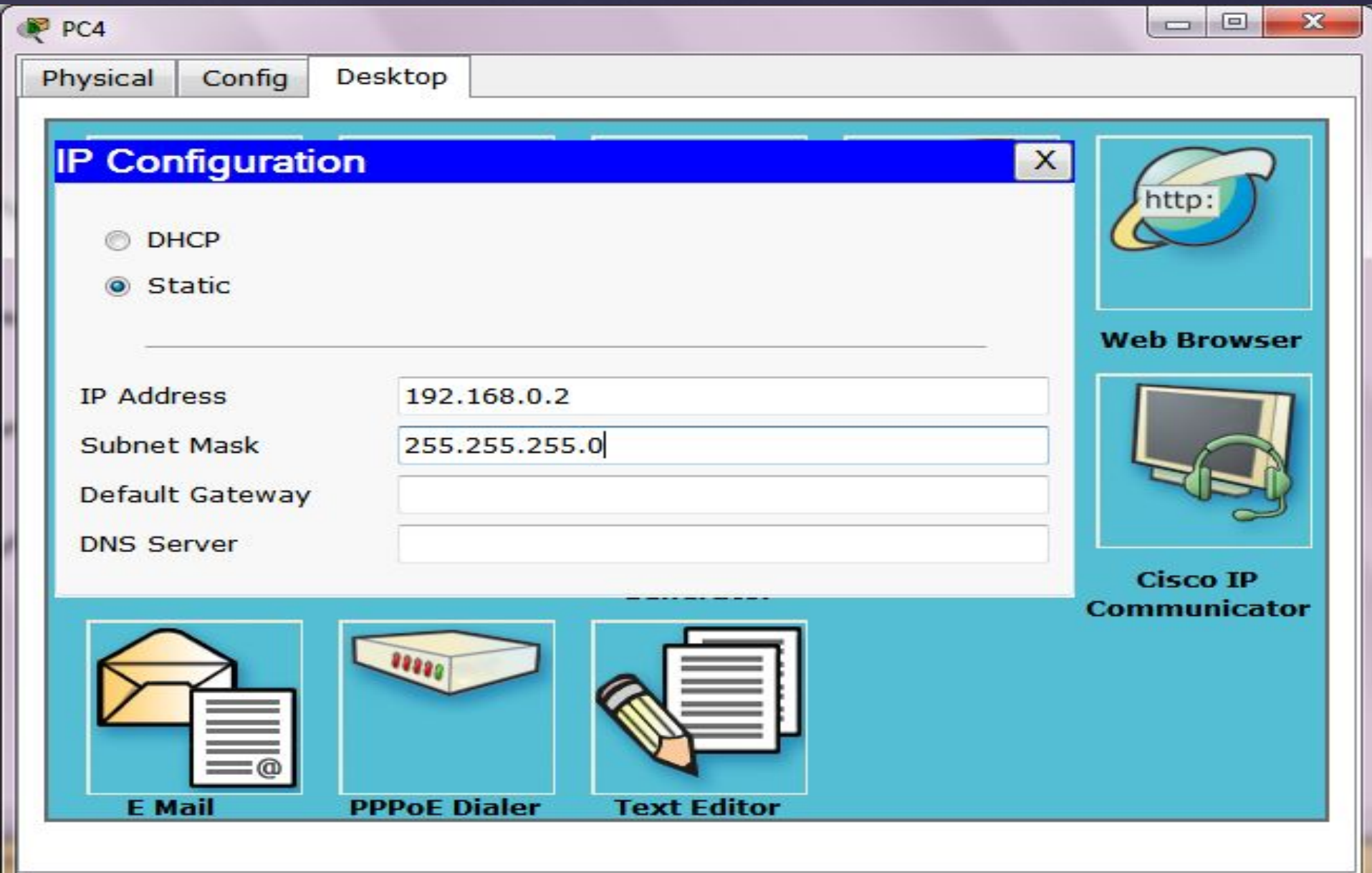
# Double click on Pc



Goto desktop tab and click ip configuration



Insert ip of the 1<sup>st</sup> pc subnet will automatically generate and leave the gateway right now





Ip of 2<sup>nd</sup> pc

PC5

Physical Config Desktop

## IP Configuration


☐ DHCP  
☒ Static


IP Address: 192.168.0.3


Subnet Mask: 255.255.255.0


Default Gateway:


DNS Server:

 **Web Browser**

 **Cisco IP Communicator**

 **E Mail**

 **PPPoE Dialer**

 **Text Editor**

IP of 3<sup>rd</sup> PC


PC6


Physical Config Desktop


### IP Configuration


☐ DHCP  
☒ Static


IP Address: 192.168.0.4  
Subnet Mask: 255.255.255.0  
Default Gateway:  
DNS Server:

  
**Web Browser**

  
**Cisco IP Communicator**

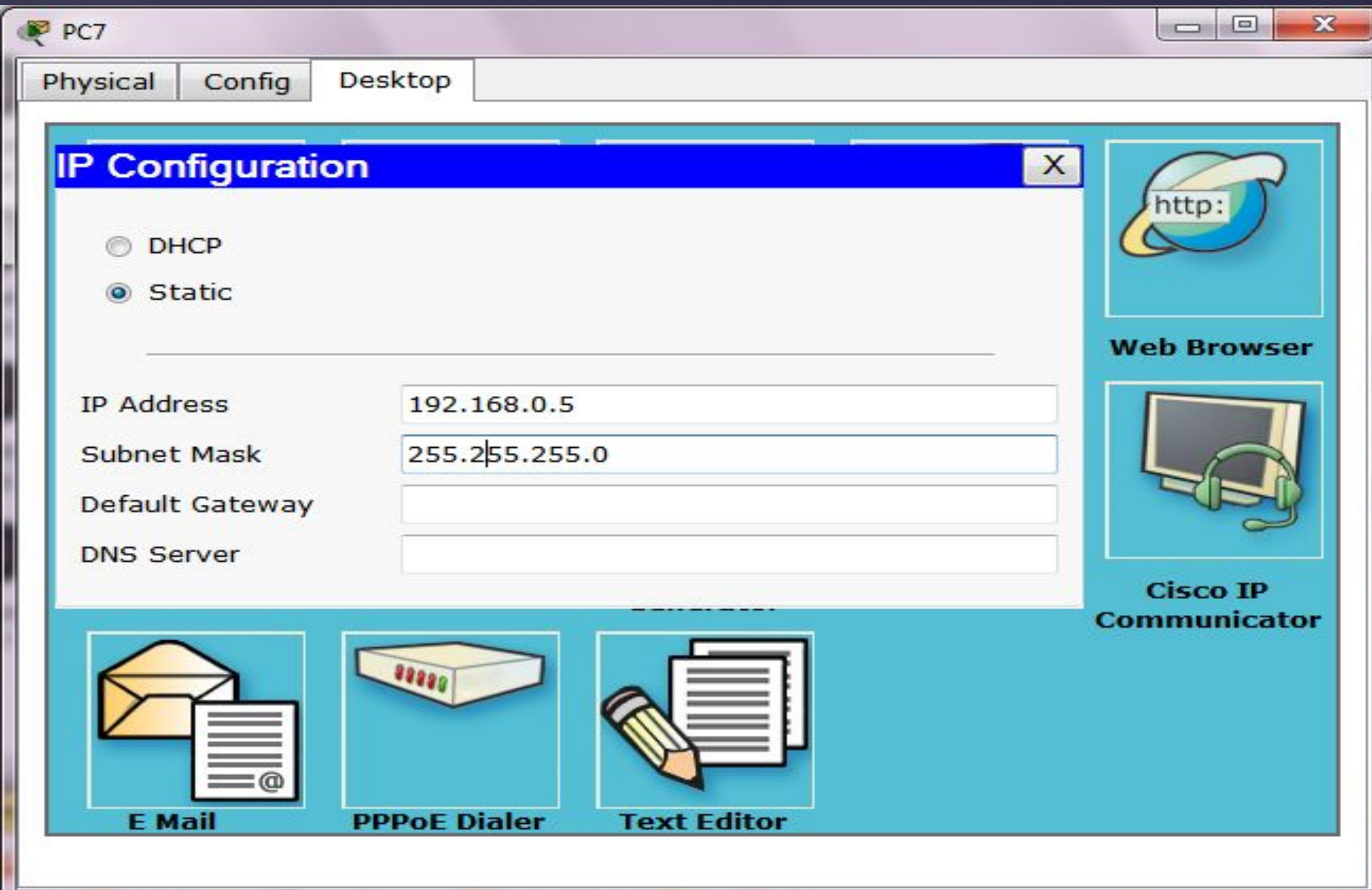
  
**E Mail**

  
**PPPoE Dialer**

  
**Text Editor**



IP of 4<sup>th</sup> PC





Assign IP's to the PC's In the  
2<sup>nd</sup> network

like

192.168.10.2

192.168.10.3

192.168.10.4

192.168.10.5

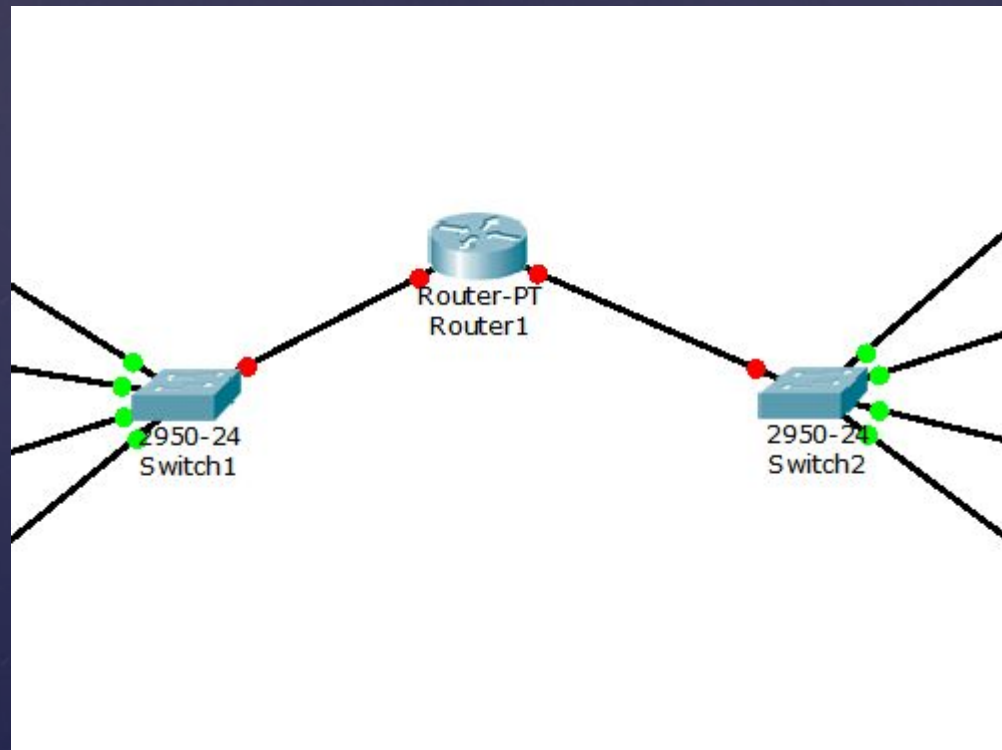
# Connecting Network With One Router

Connect One Generic Router

Connect It With Switch 0 from fast ethernet 0/0,

Connect It With Switch 1 from fast ethernet 1/0

With Copper straight through cabbble



# Configuring router



Router connected with the network one from fast ethernet 0/0

1) double click on router 2) goto config tab 3) click fast ethernet 0/0

The screenshot shows a window titled "Router1" with three tabs: "Physical", "Config", and "CLI". The "Config" tab is active. On the left, there is a sidebar with a tree view containing the following categories and items:

- GLOBAL**
  - Settings
  - Algorithm Settings
- ROUTING**
  - Static
  - RIP
- INTERFACE**
  - FastEthernet0/0 (selected)
  - FastEthernet1/0
  - Serial2/0
  - Serial3/0
  - FastEthernet4/0
  - FastEthernet5/0

The main area displays the configuration for "FastEthernet0/0". The settings are as follows:

Parameter	Value
Port Status	<input type="checkbox"/> Off <input checked="" type="checkbox"/> On
Bandwidth	<input type="radio"/> 10 Mbps <input checked="" type="radio"/> 100 Mbps
Duplex	<input checked="" type="checkbox"/> Auto <input type="checkbox"/> Full Duplex <input type="checkbox"/> Half Duplex
MAC Address	0090.2BCC.2C36
IP Address	
Subnet Mask	
Tx Ring Limit	10

### Equivalent IOS Commands

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
```

Insert ip of the class as the network 1 have  
So i inserts the ip 192.168.0.1  
subnet will automatically generate  
make sue port status on

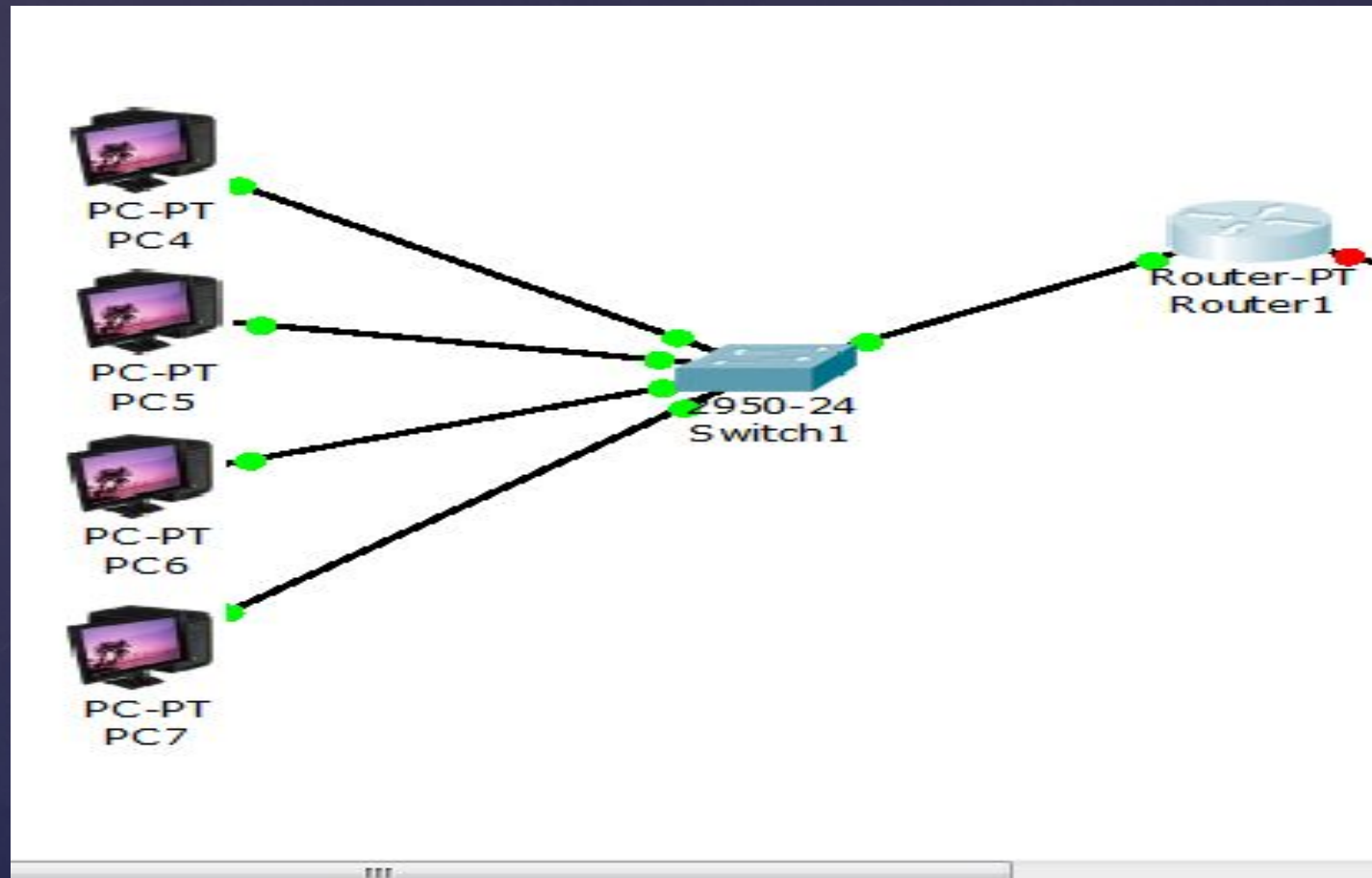
The screenshot shows a window titled "Router1" with three tabs: "Physical", "Config", and "CLI". The "Config" tab is active, and the "INTERFACE" section is selected in the left sidebar. The "FastEthernet0/0" interface is chosen. The main area displays the configuration for this interface:

FastEthernet0/0	
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input checked="" type="checkbox"/> Auto
<input type="radio"/> 10 Mbps <input checked="" type="radio"/> 100 Mbps	
Duplex	<input checked="" type="checkbox"/> Auto
<input type="radio"/> Full Duplex <input checked="" type="radio"/> Half Duplex	
MAC Address	0090.2BCC.2C36
IP Address	192.168.0.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

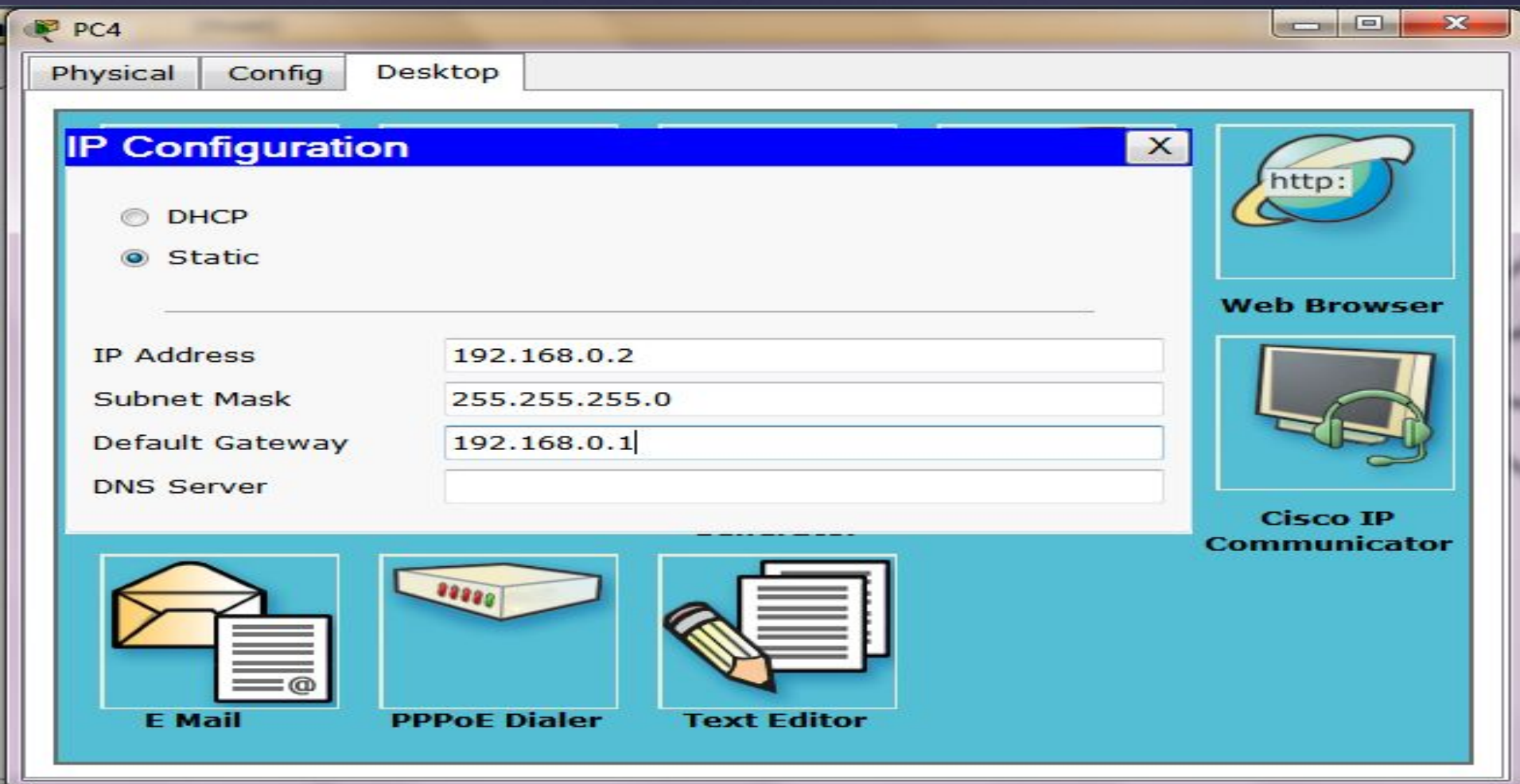
### Equivalent IOS Commands

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#
```

# Router is configured with network 1



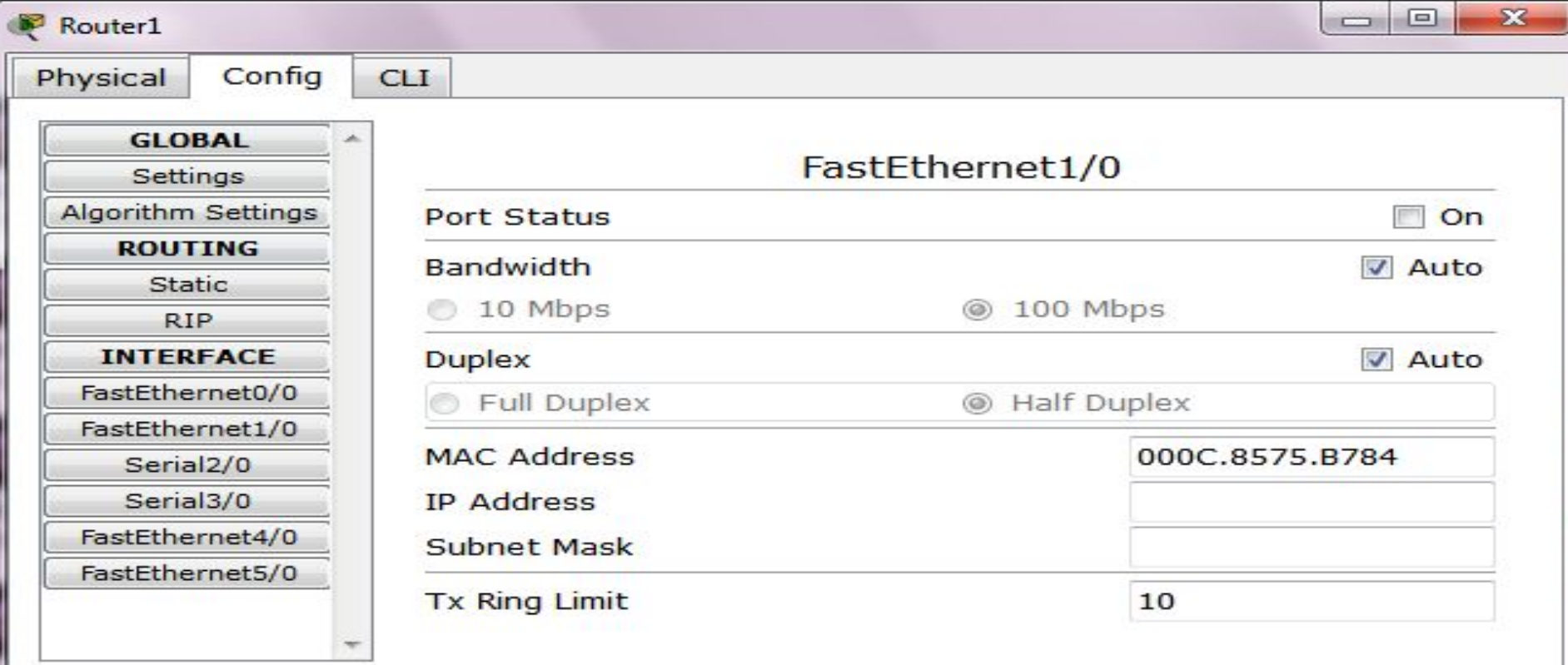
Insert gateway of all pc's in network one , the ip of router through which they are connected  
192.168.0.1





Router connected with the network 2 from fast ethernet 1/0

1) double click on router 2) goto config tab 3) click fast ethernet 1/0



The screenshot shows a window titled "Router1" with three tabs: "Physical", "Config", and "CLI". The "Config" tab is active. On the left, a sidebar lists configuration categories: "GLOBAL", "ROUTING", and "INTERFACE". Under "INTERFACE", "FastEthernet1/0" is selected. The main area displays the configuration for "FastEthernet1/0".

**FastEthernet1/0**

Port Status	<input type="checkbox"/> Off <input checked="" type="checkbox"/> On
Bandwidth	<input checked="" type="checkbox"/> Auto
	<input type="radio"/> 10 Mbps <input checked="" type="radio"/> 100 Mbps
Duplex	<input checked="" type="checkbox"/> Auto
	<input type="radio"/> Full Duplex <input checked="" type="radio"/> Half Duplex
MAC Address	000C.8575.B784
IP Address	
Subnet Mask	
Tx Ring Limit	10

**Equivalent IOS Commands**

```
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
```

Insert ip of the class as the network 2 have  
So i inserts the ip 192.168.10.1  
subnet will automatically generate  
make sue port status on

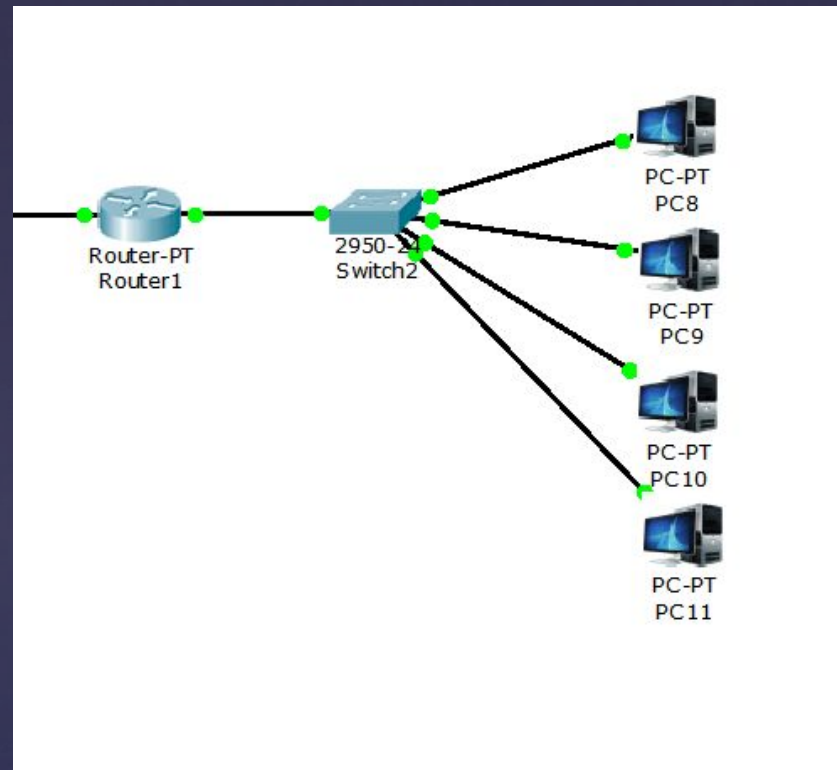
The screenshot shows a window titled "Router1" with three tabs: "Physical", "Config", and "CLI". The "Config" tab is active. On the left is a sidebar with a tree view containing "GLOBAL", "ROUTING", and "INTERFACE". Under "INTERFACE", "FastEthernet1/0" is selected. The main area displays the configuration for "FastEthernet1/0".

FastEthernet1/0	
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input checked="" type="checkbox"/> Auto
<input type="radio"/> 10 Mbps <input checked="" type="radio"/> 100 Mbps	
Duplex	<input checked="" type="checkbox"/> Auto
<input type="radio"/> Full Duplex <input checked="" type="radio"/> Half Duplex	
MAC Address	000C.8575.B784
IP Address	192.168.10.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

### Equivalent IOS Commands

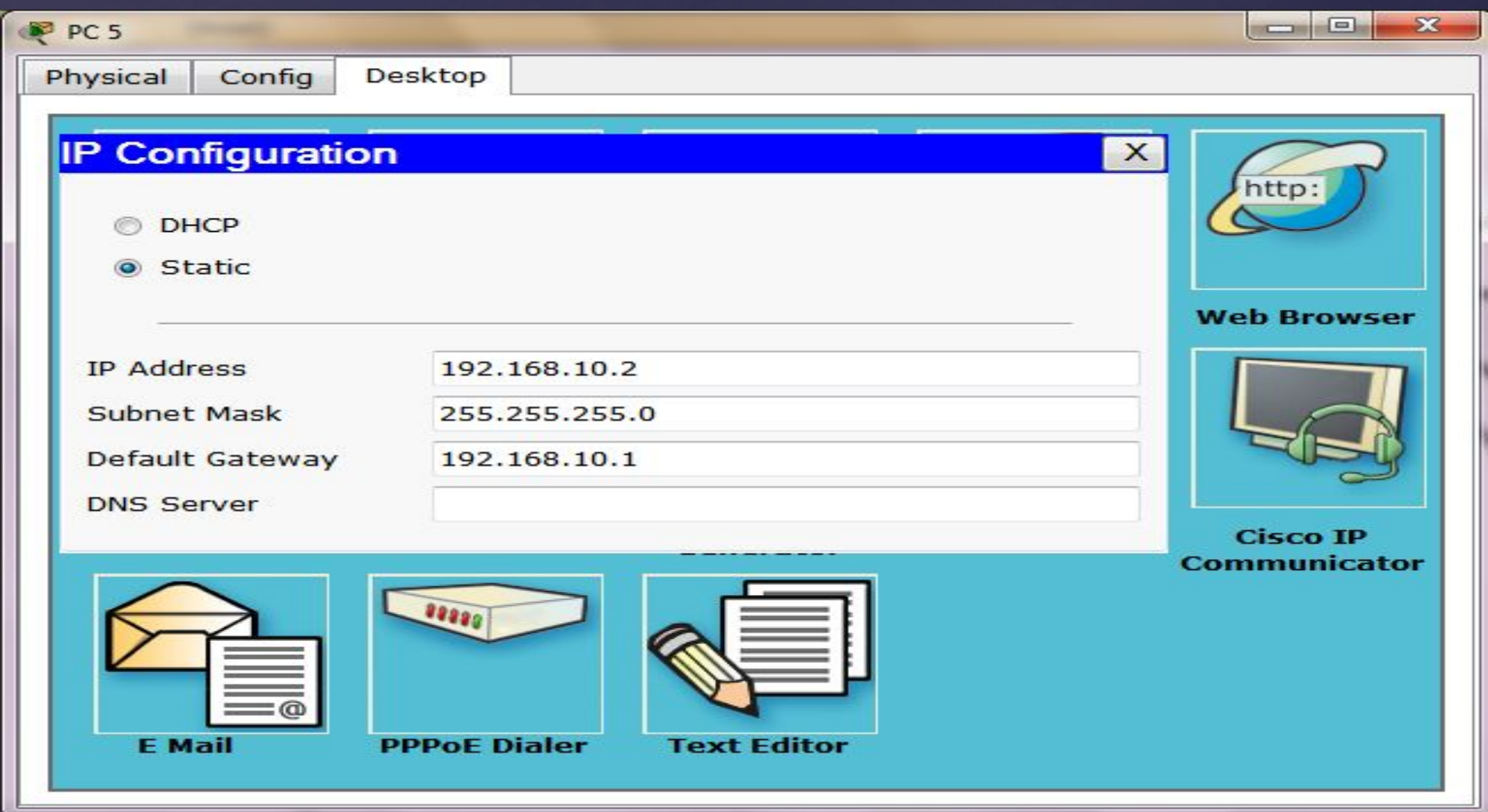
```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
Router(config-if)#
```





Router is configured with network 1

Insert gateway of all pc's in network one , the ip of router through which they are connected  
192.168.0.1



□ 1<sup>st</sup> network is

192.168.0.1

192.168.0.2

192.168.0.3

192.168.0.4

192.168.0.4

So add the rip address 192.168.0.0

And click add

Add the rip address 192.168.10.0

For the 2<sup>nd</sup> network

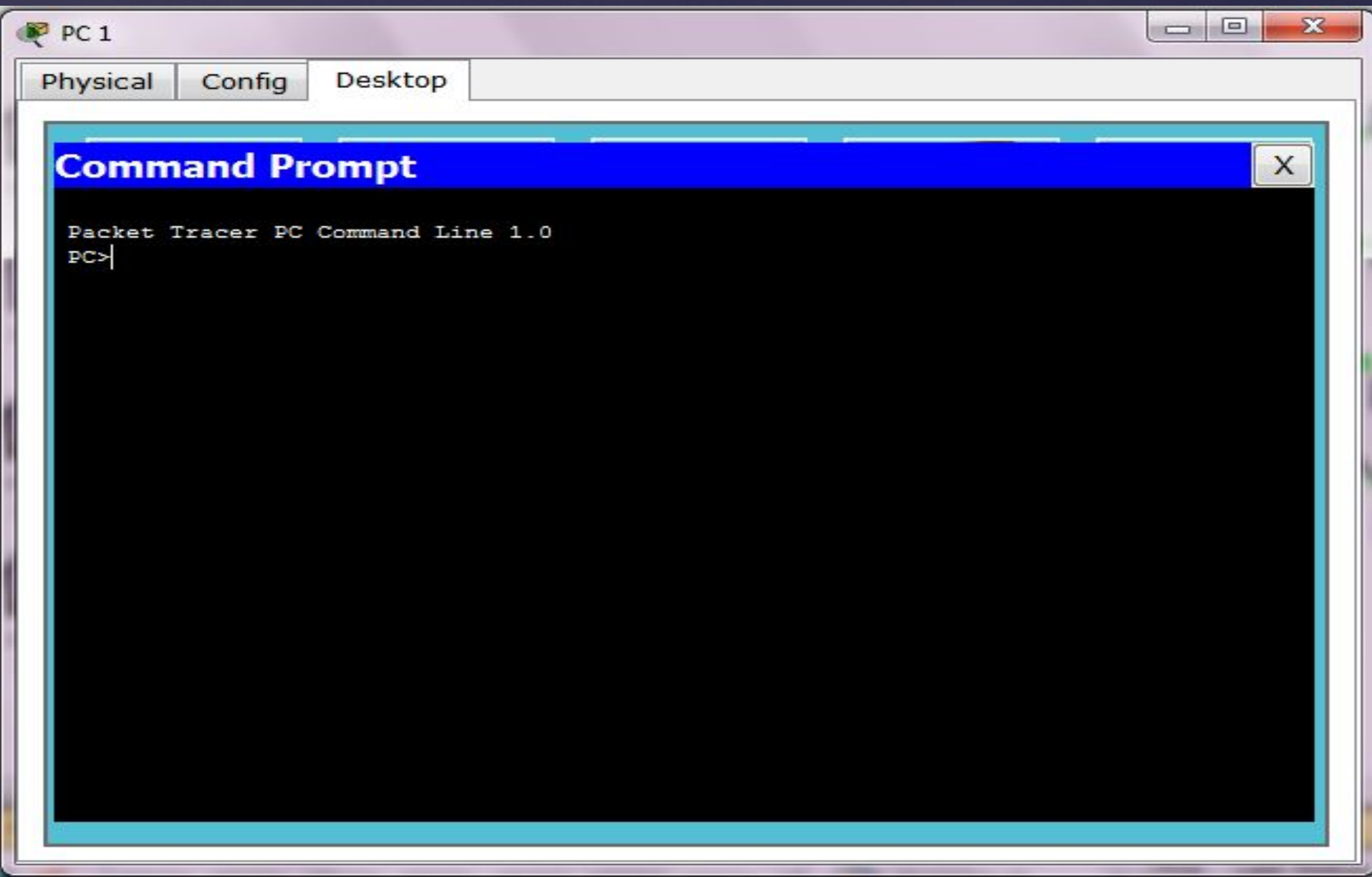
## Add Router Information Protocol

Double click on router Click config Tab

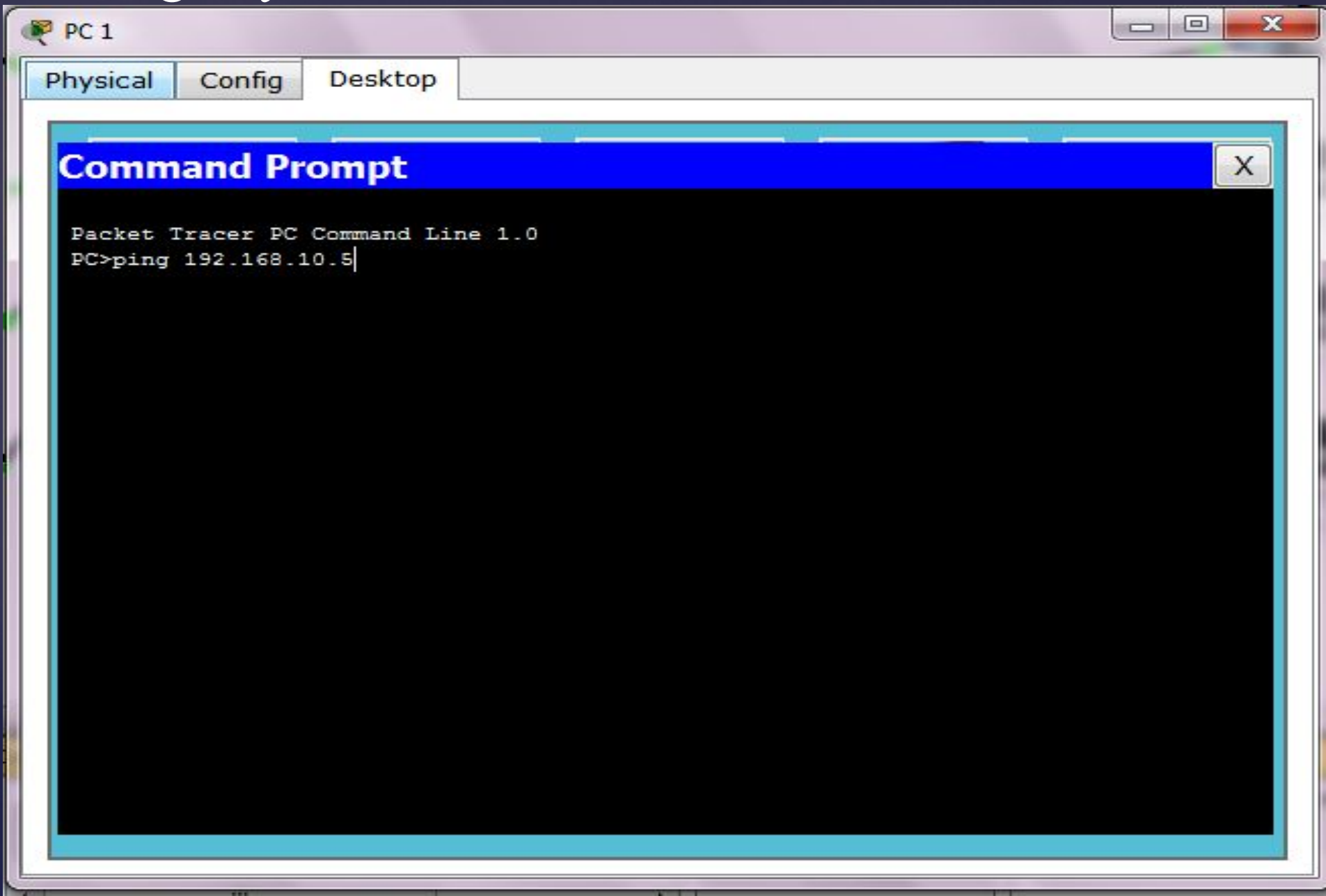
Click rip

# Pinging

# Goto the command prompt of any pc



# Ping any IP of the network





# Now what you see is

```
PC>ping 192.168.10.5
```

```
Pinging 192.168.10.5 with 32 bytes of data:
```

```
Reply from 192.168.10.5: bytes=32 time=16ms TTL=127
```

```
Reply from 192.168.10.5: bytes=32 time=18ms TTL=127
```

```
Reply from 192.168.10.5: bytes=32 time=18ms TTL=127
```

```
Reply from 192.168.10.5: bytes=32 time=20ms TTL=127
```

```
Ping statistics for 192.168.10.5:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 16ms, Maximum = 20ms, Average = 18ms
```

```
PC>|
```

Thank You