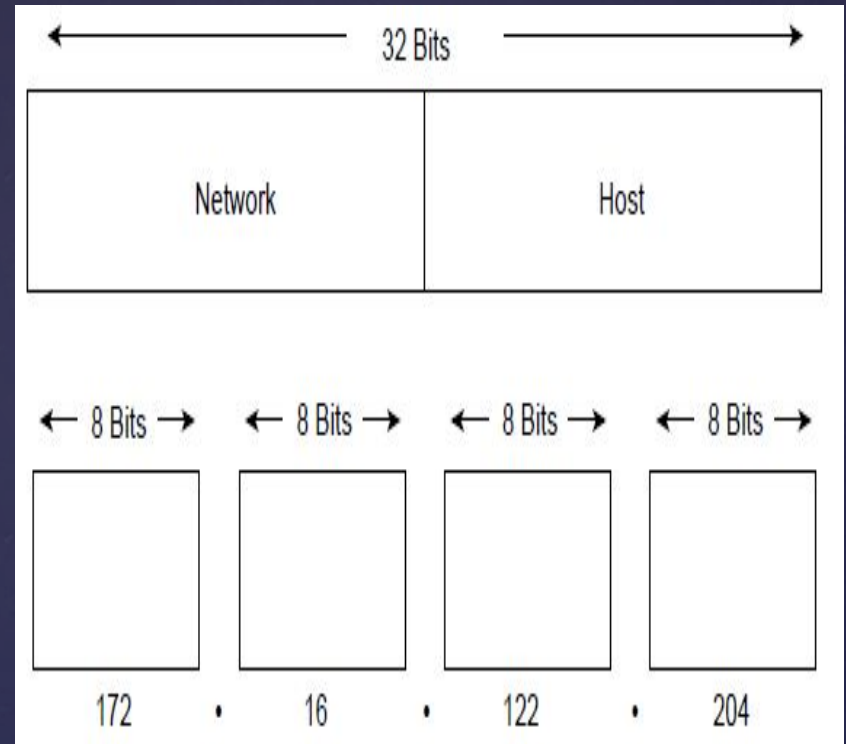


# SUBNETTING

{

# 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 software interface. The main workspace shows a network topology with two switches, labeled "2950-24 Switch1" and "2950-24 Switch2", connected by a single line. On the left side of Switch1, four PC-PT devices are stacked vertically, labeled PC4, PC5, PC6, and PC7. On the right side of Switch2, four PC-PT devices are stacked vertically, labeled PC8, PC9, PC10, and PC11. The interface includes a top menu bar with "File", "Edit", "Options", "View", "Tools", "Extensions", and "Help". Below the menu is a toolbar with various icons for file operations, navigation, and simulation. A yellow status bar at the top of the workspace area shows "Logical [Root]" and buttons for "New Cluster", "Move Object", "Set Tiled Background", and "Viewport". On the right side of the workspace, there is a vertical toolbar with icons for selection, deletion, and zooming. At the bottom of the interface, there is a "Time: 00:12:15" display, a "Power Cycle Devices" button, and a "Realtime" tab. Below these, there is a "Scenario 0" dropdown menu, "New" and "Delete" buttons, and a "Toggle PDU List Window" button. The bottom-most section contains a "PDU List" window with columns for "Fire", "Last Status", "Source", "Destination", "Type", and "Color".

Cisco Packet Tracer

File Edit Options View Tools Extensions Help

Logical [Root] New Cluster Move Object Set Tiled Background Viewport

PC-PT PC4  
PC-PT PC5  
PC-PT PC6  
PC-PT PC7

2950-24 Switch1

2950-24 Switch2

PC-PT PC8  
PC-PT PC9  
PC-PT PC10  
PC-PT PC11

Time: 00:12:15 Power Cycle Devices

Realtime

Scenario 0

New Delete

Toggle PDU List Window

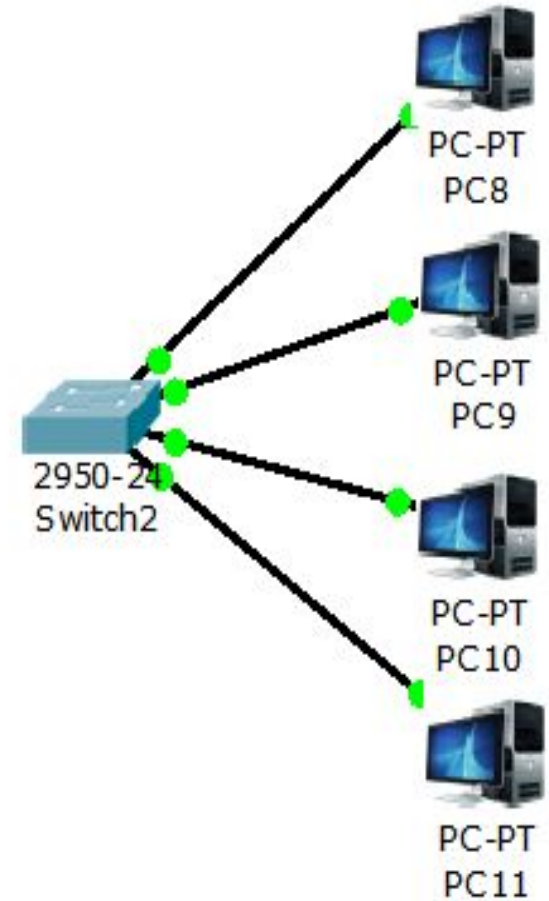
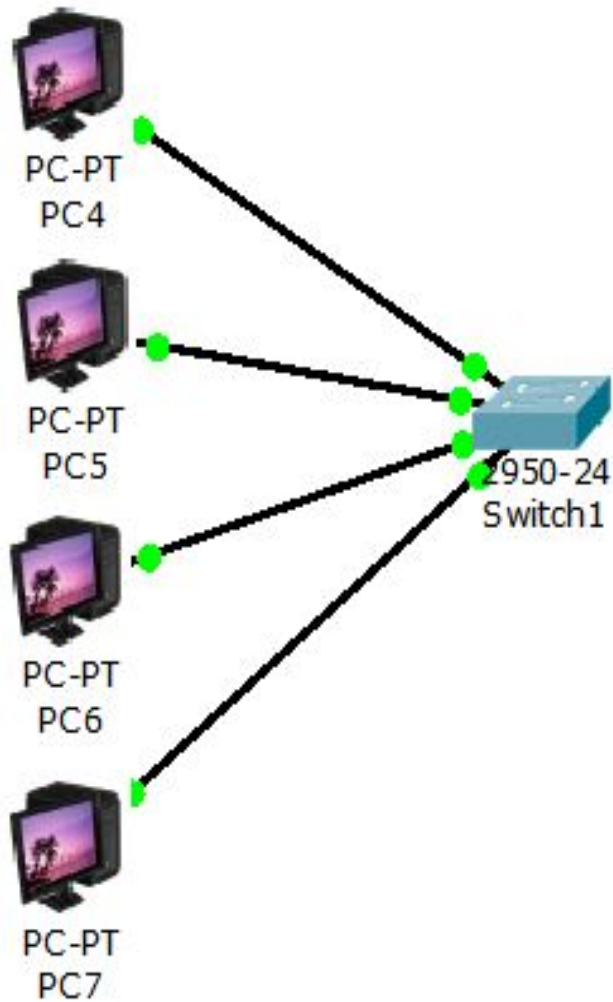
Fire Last Status Source Destination Type Color

End Devices

Generic Generic Generic Generic IPPhone VoIP Device Phone

PC-PT

Connect All of them With copper straight through cable



# Assigning IP

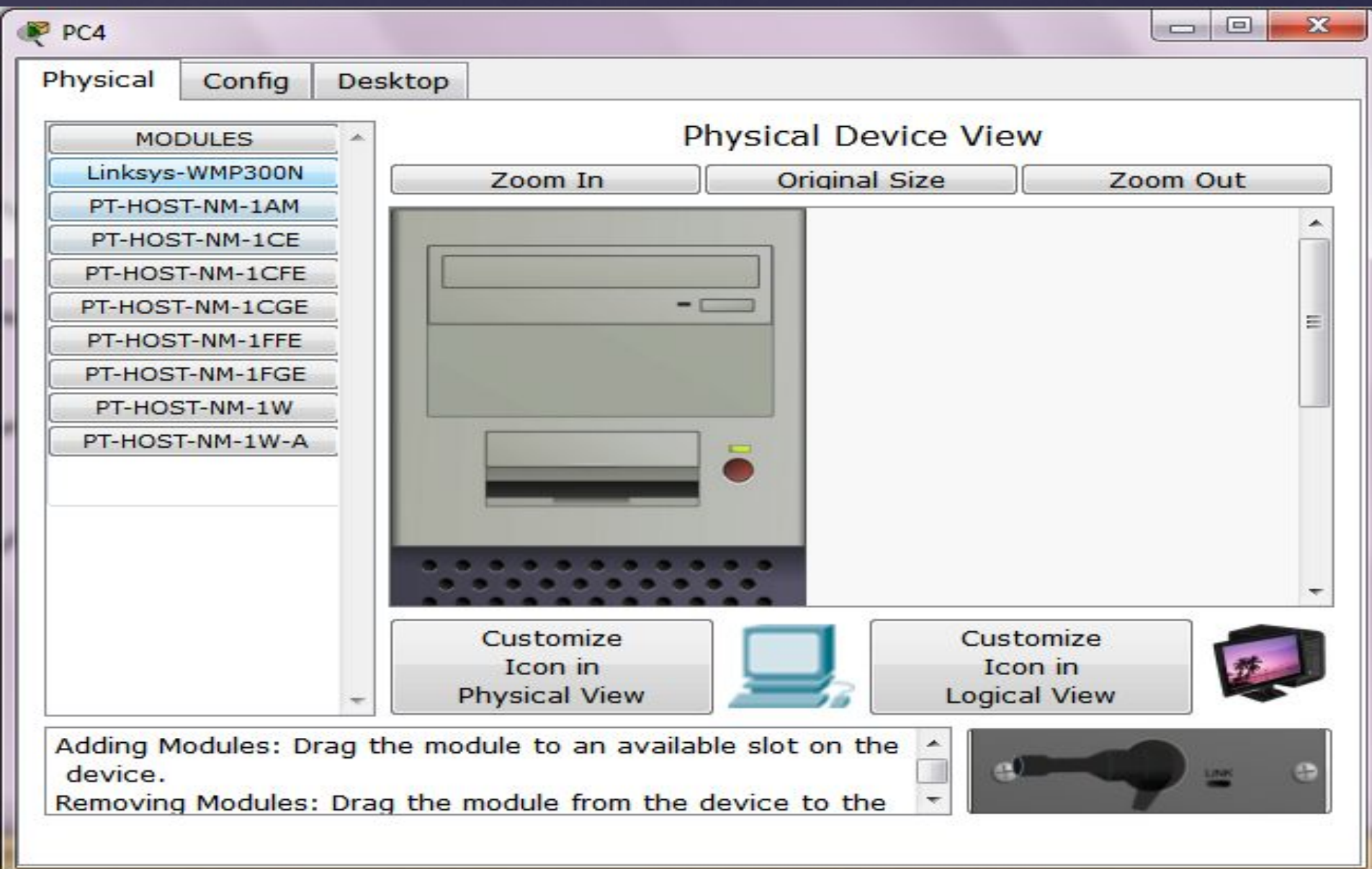
10.0.0.1	To	10.255.255.254
172.16.0.1	To	172.31.255.254
192.168.0.1	To	192.168.255.254

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

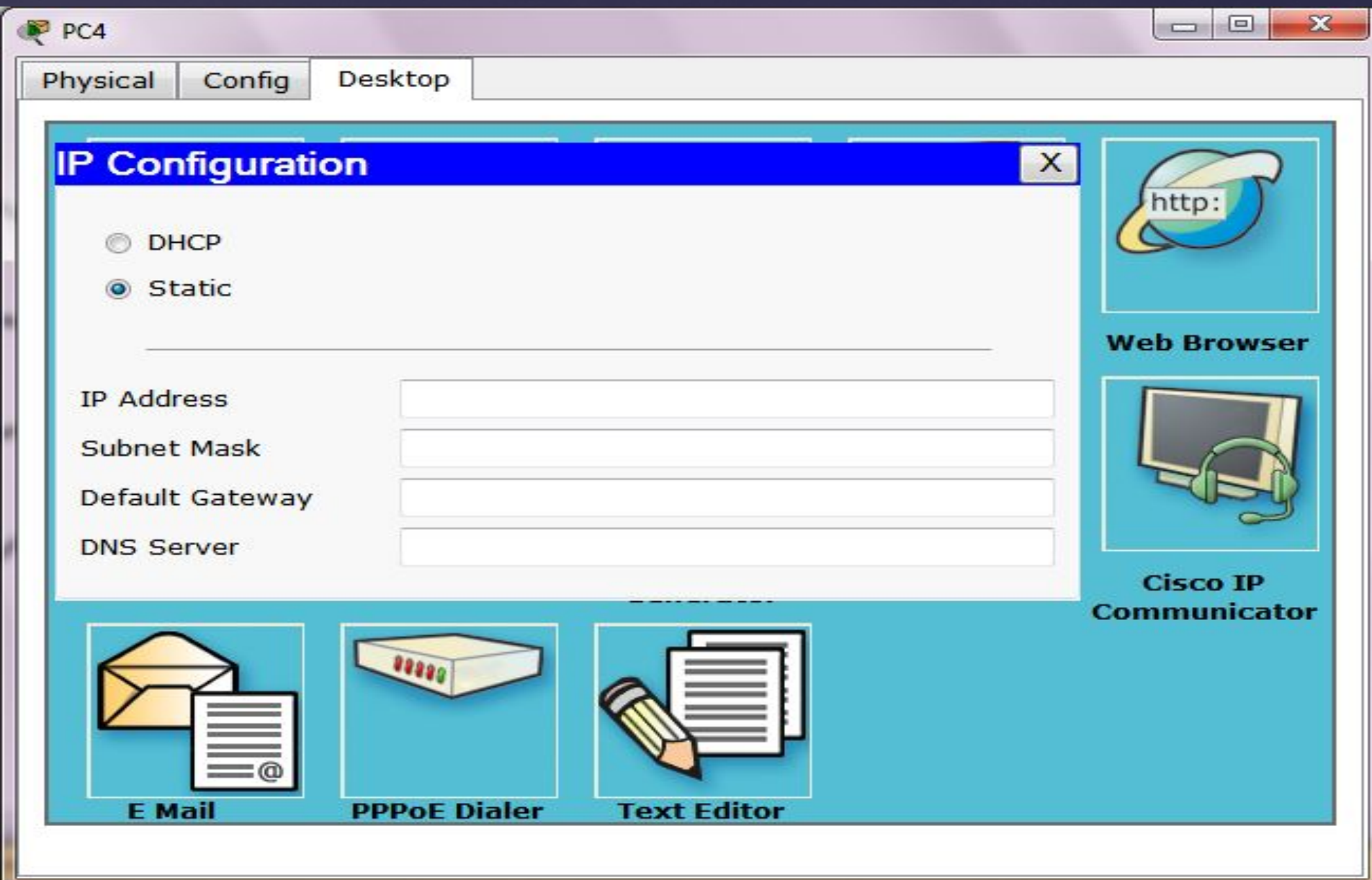


Assign ip To pc's in 1<sup>st</sup>  
network

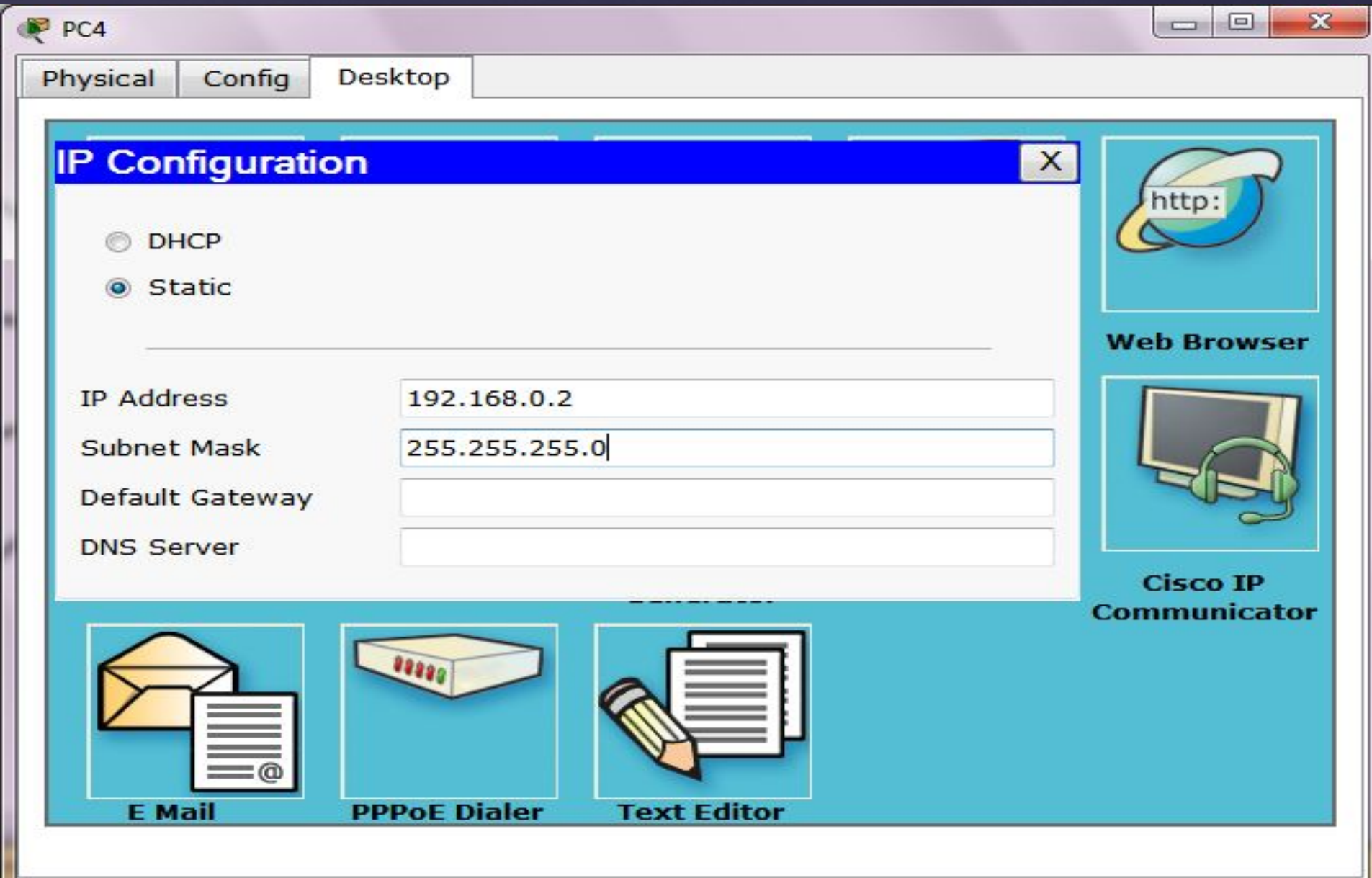
# Double click on Pc



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**

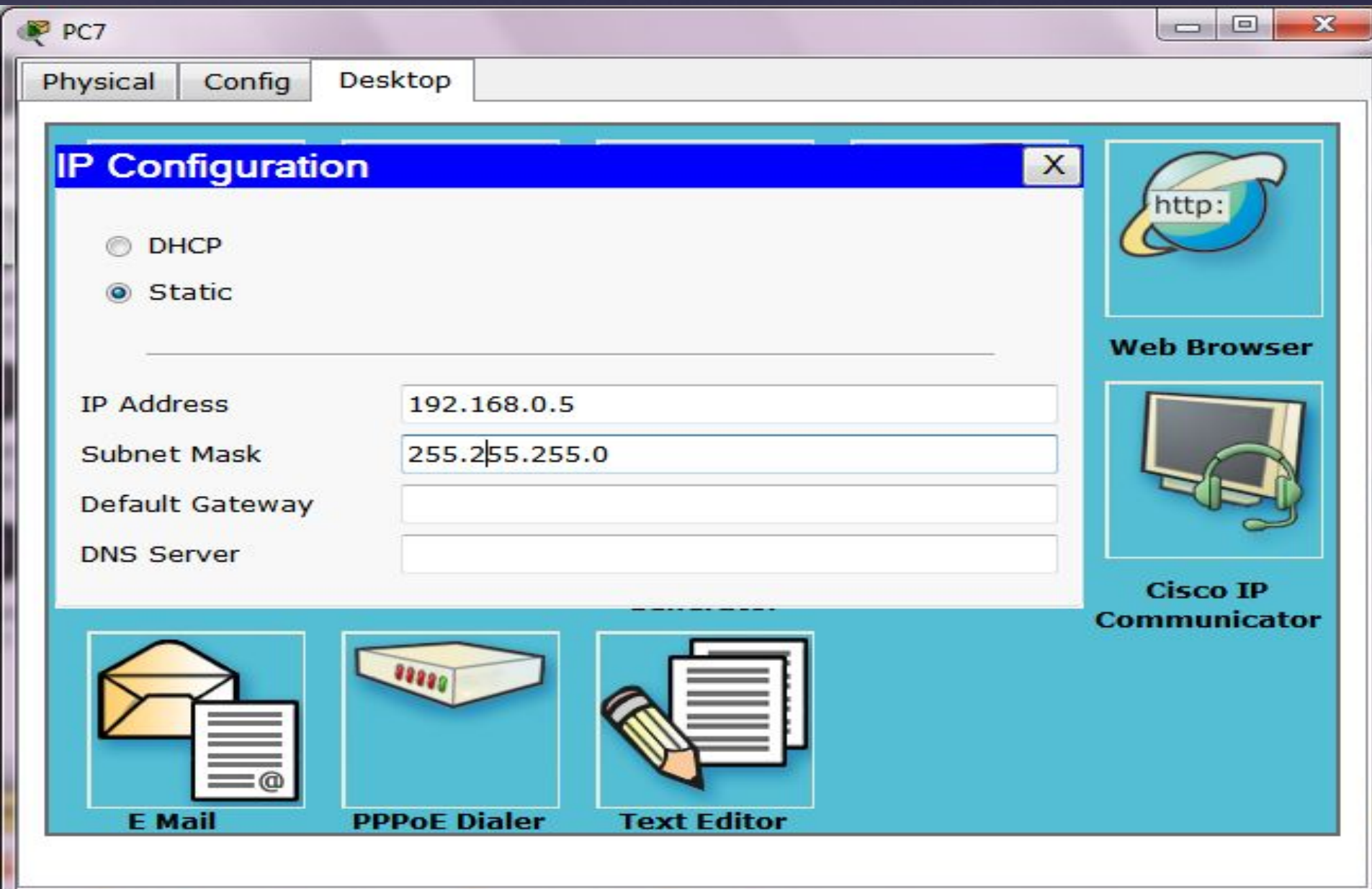
  
**E Mail**

  
**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

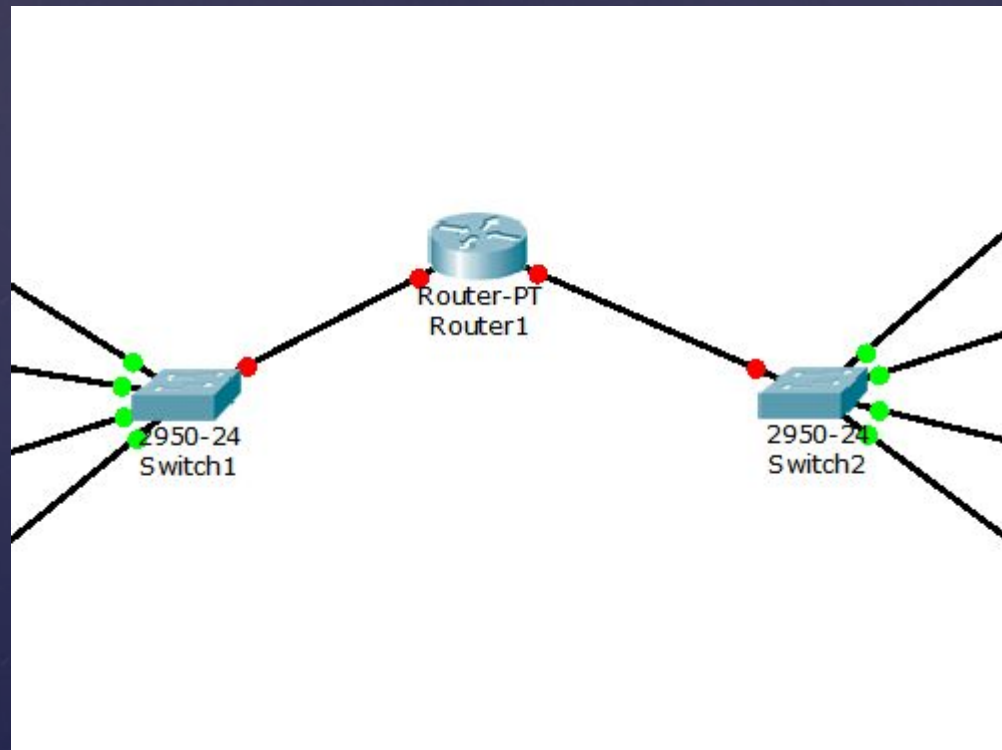
# Connecting Network With One Router

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

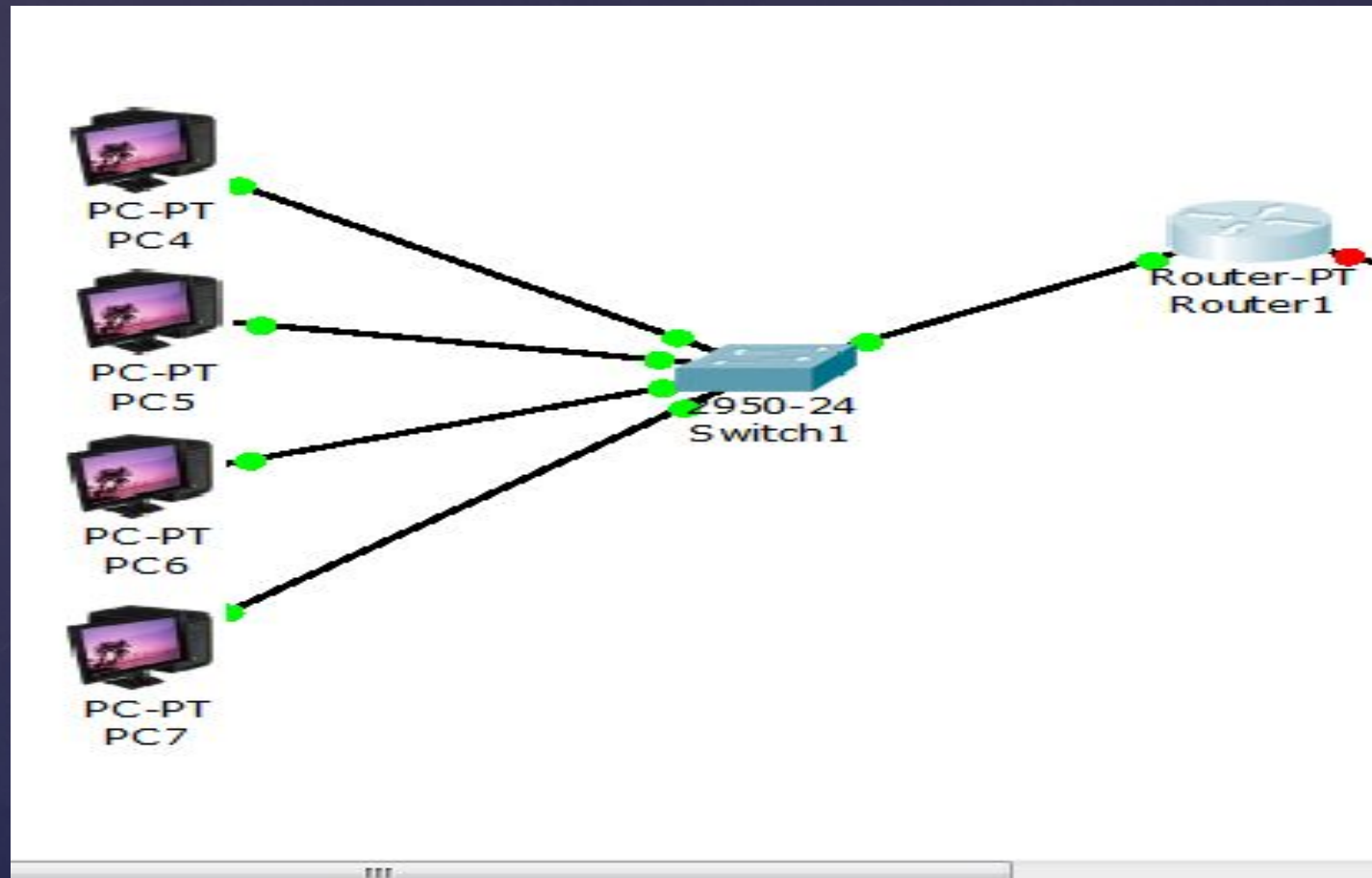
The screenshot shows a window titled "Router1" with three tabs: "Physical", "Config", and "CLI". The "Config" tab is active, and the "INTERFACE" section is selected in the left sidebar. The "FastEthernet0/0" interface is highlighted. The main area displays the configuration for "FastEthernet0/0".

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

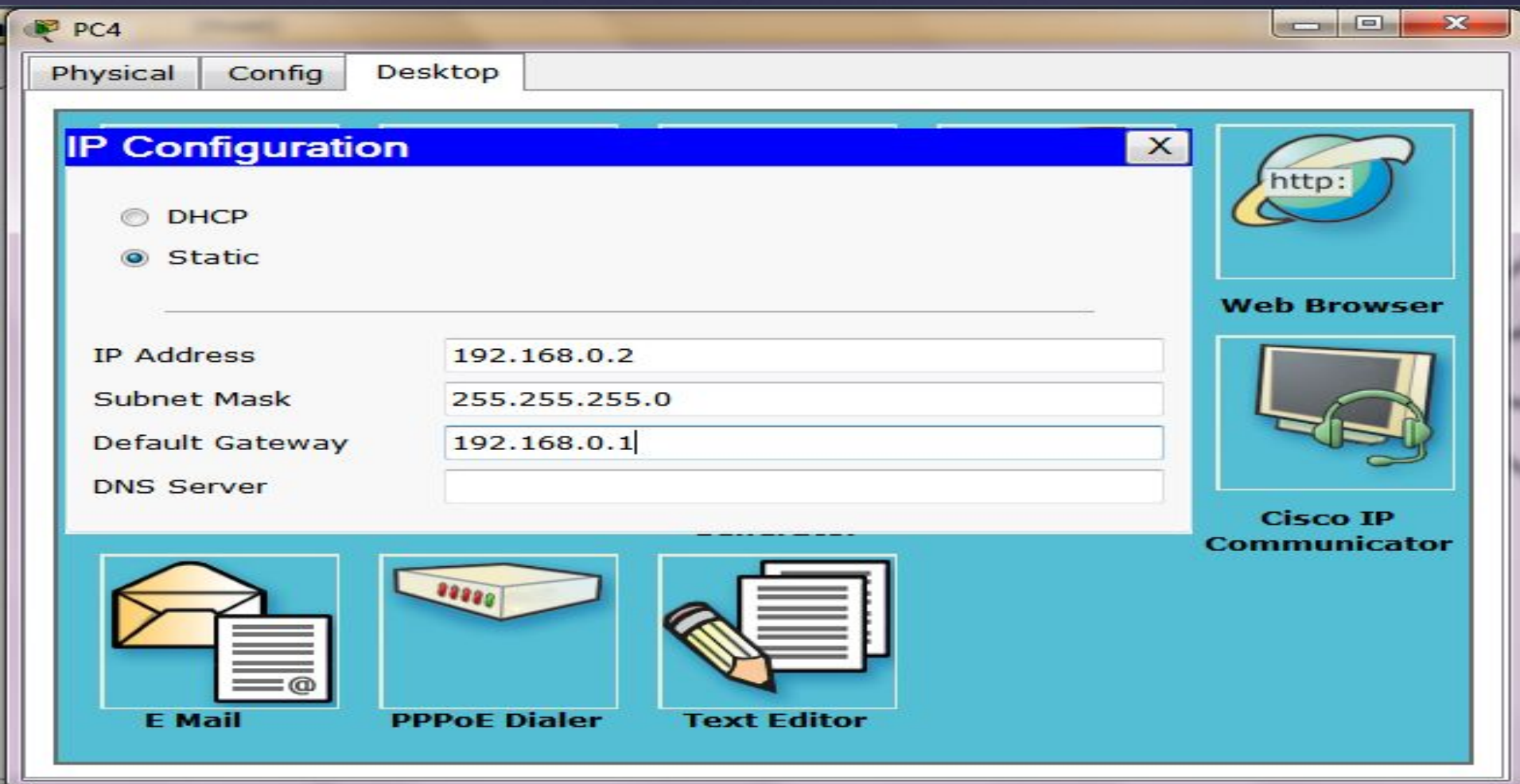
### Equivalent IOS Commands

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

# Router is configured with network 1



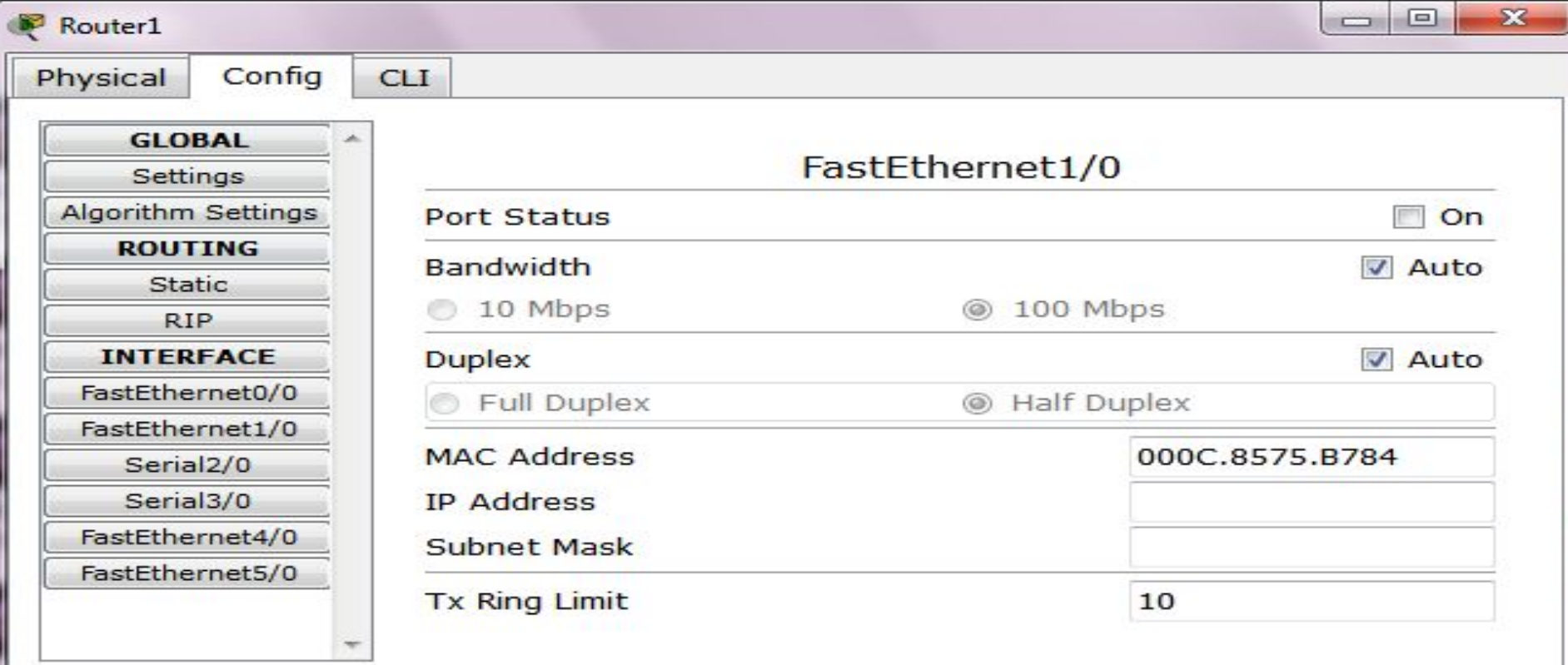
Insert gateway of all pc's in network one , the ip of router through which they are connected  
192.168.0.1





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"/> 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

Router1

Physical Config CLI

**GLOBAL**

Settings

Algorithm Settings

**ROUTING**

Static

RIP

**INTERFACE**

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

**FastEthernet1/0**

Port Status ☒ On

Bandwidth ☒ Auto

☐ 10 Mbps ☒ 100 Mbps

Duplex ☒ Auto

☐ Full Duplex ☒ Half Duplex

MAC Address 000C.8575.B784

IP Address 192.168.10.1

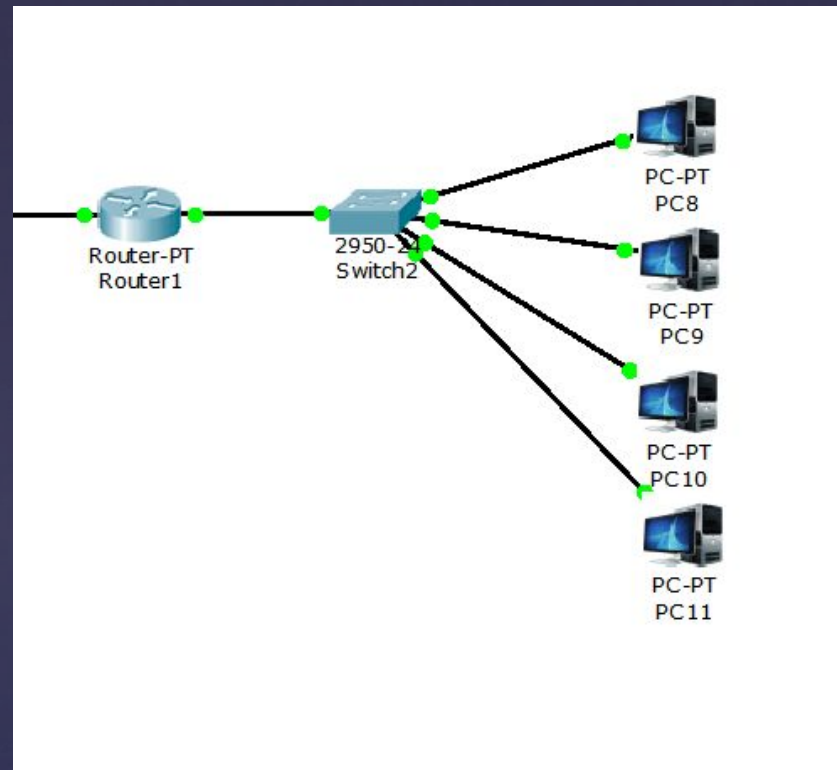
Subnet Mask 255.255.255.0

Tx Ring Limit 10

### Equivalent IOS Commands

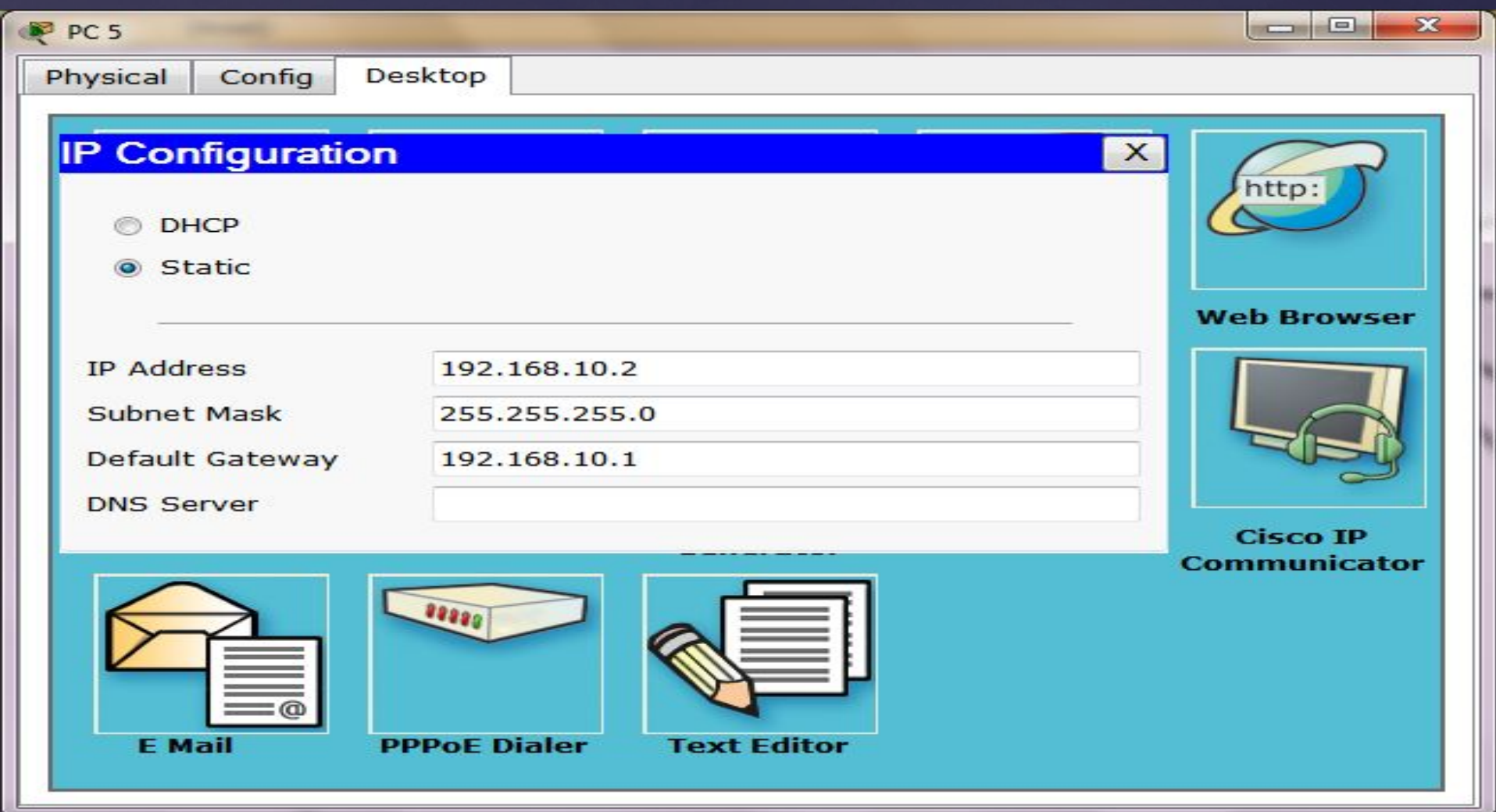
```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
Router(config-if)#
```





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

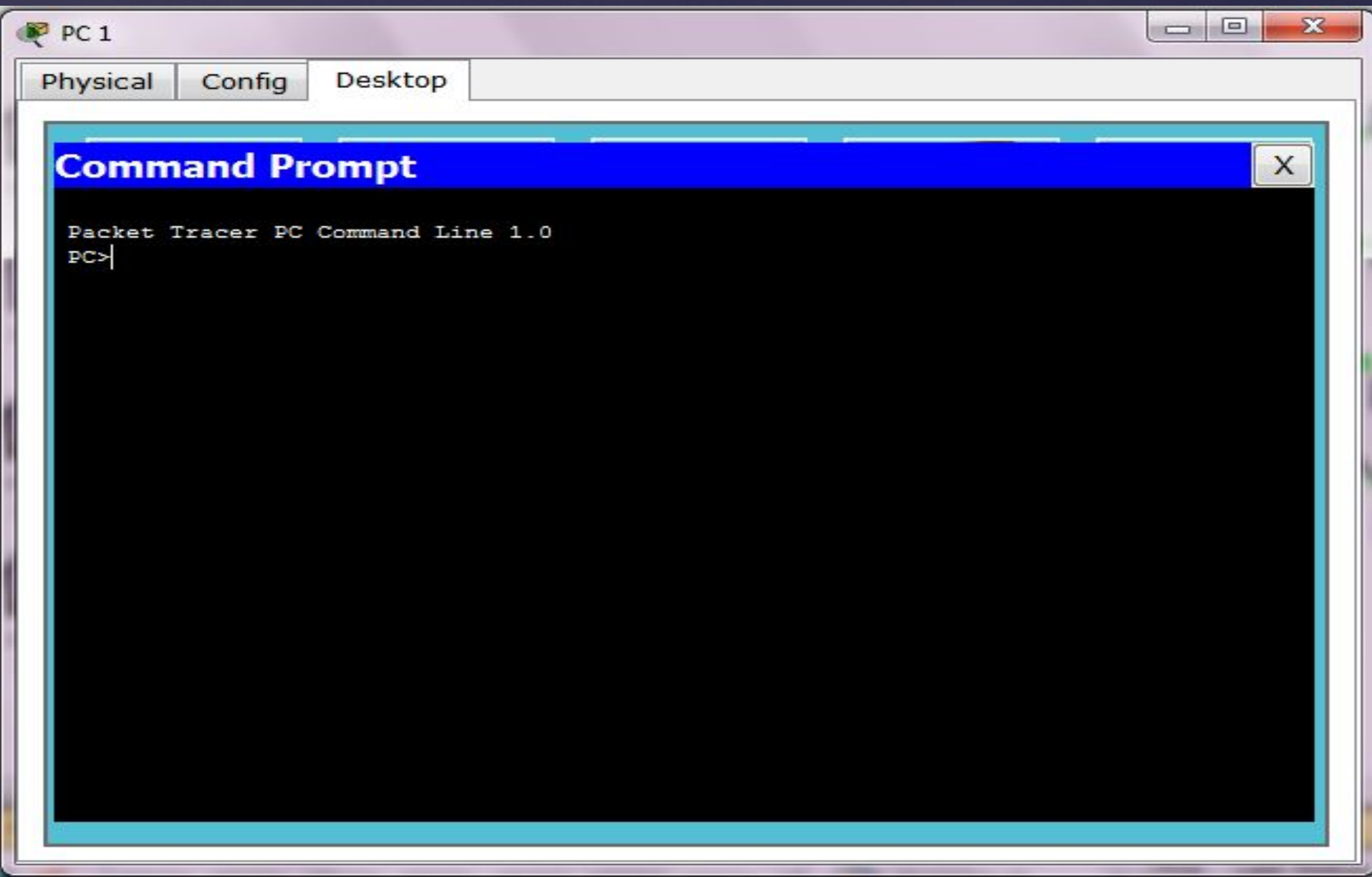
## Add Router Information Protocol

Double click on router Click config Tab

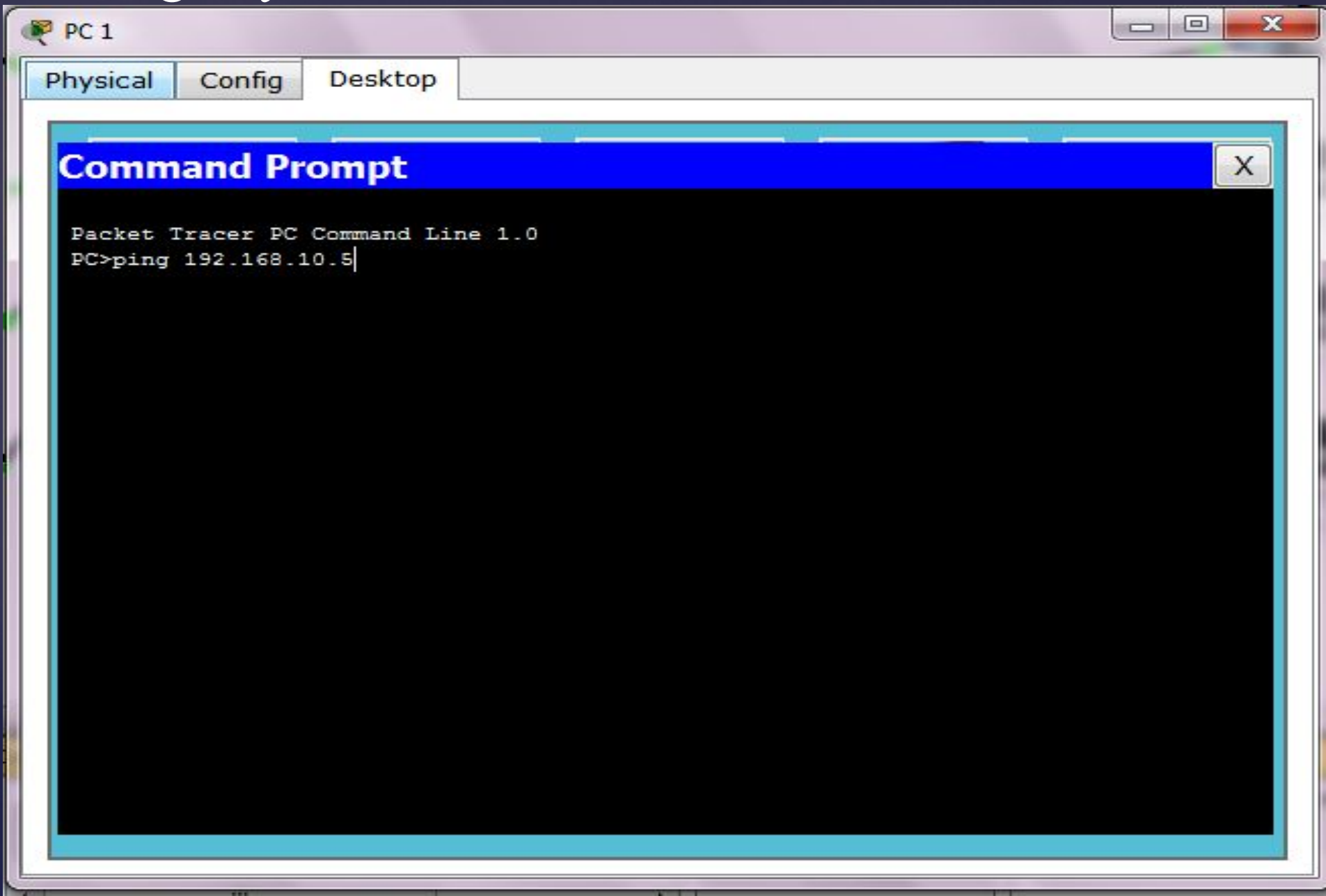
Click rip

# 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