

# NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCE

## Computer Networks Lab (CL307)

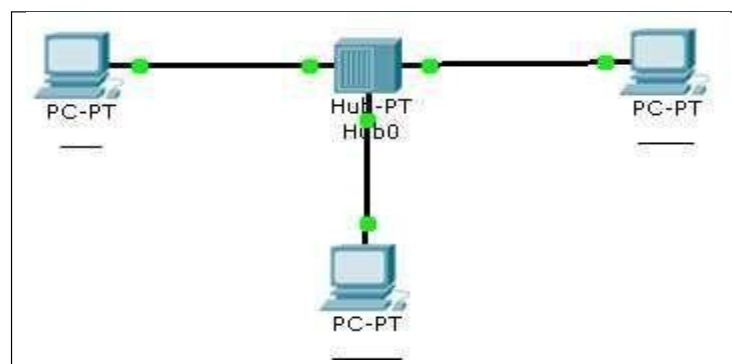
### Lab Session 05A

#### Network Infrastructure

Aim: Study of following Network (Layer 1, Layer 2 and Layer 3) Devices in Detail.

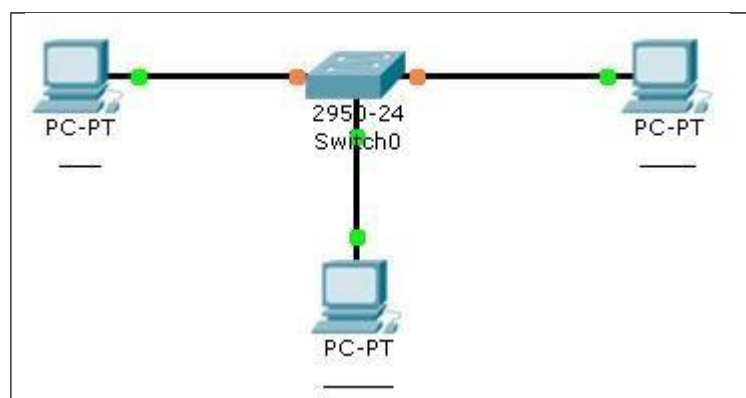
- Switch
- Hub
- Router

#### Task#1: Understand Network Topology and network hardware (L1) devices.



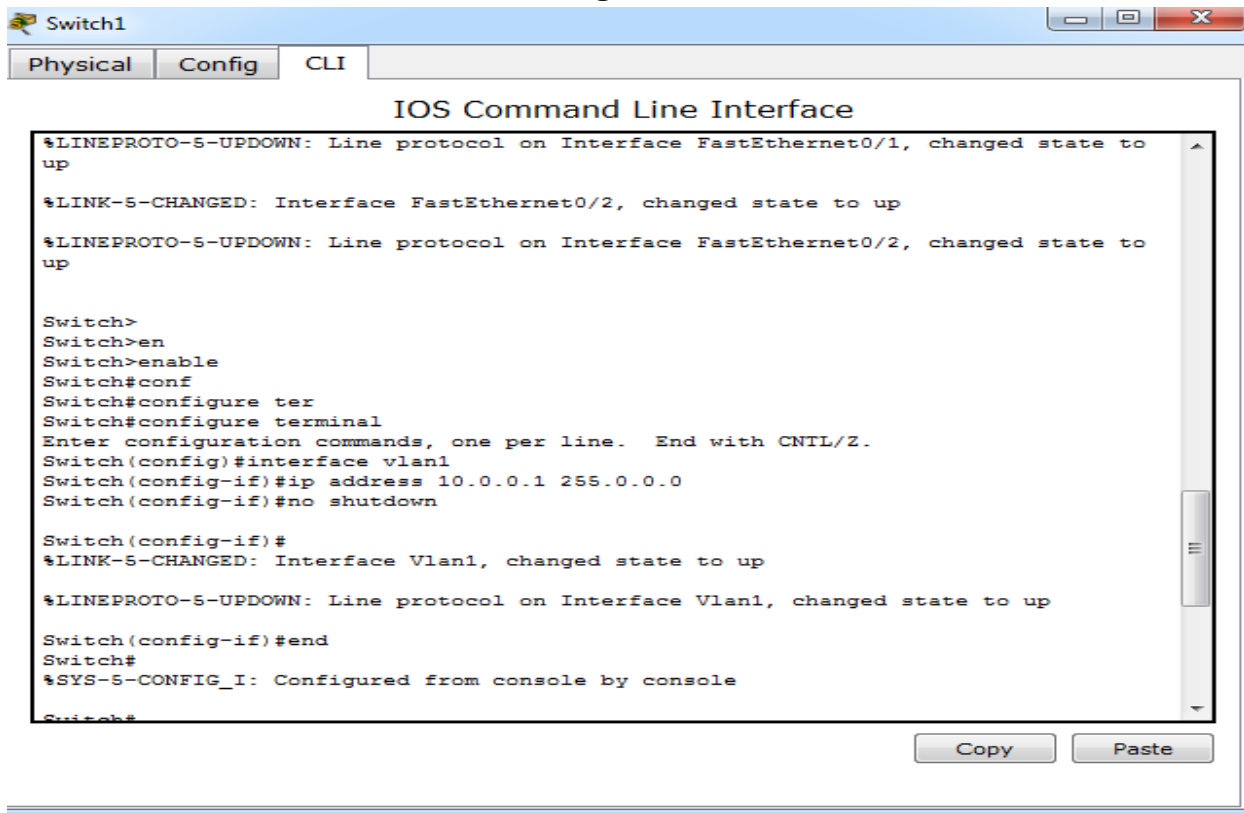
At which layer the HUB operates? \_\_\_\_\_

#### Task#2: Understand Network Topology and network hardware (L2) devices.



## CONFIGURATION:

Click Switch → CLI → then run following commands.



```
Switch1
Physical Config CLI
IOS Command Line Interface

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

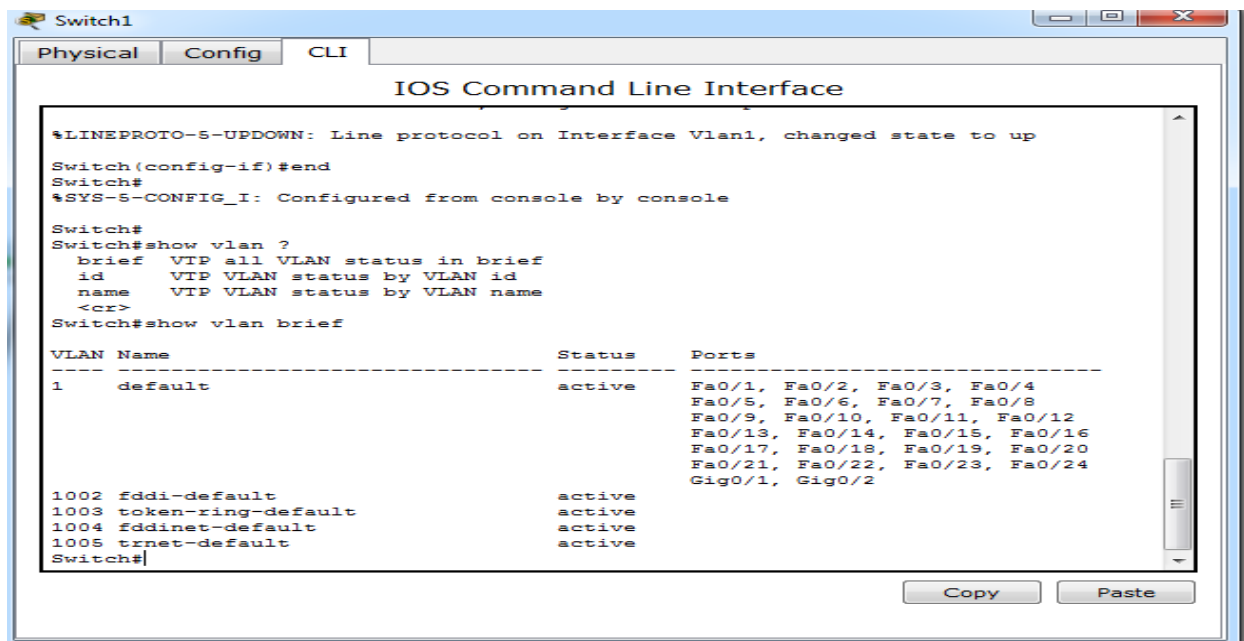
Switch>
Switch>en
Switch>enable
Switch#conf
Switch#configure ter
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan1
Switch(config-if)#ip address 10.0.0.1 255.0.0.0
Switch(config-if)#no shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#
```

We have to assign IP address on Interface Vlan1 which is default interface in Switch as shown below.



```
Switch1
Physical Config CLI
IOS Command Line Interface

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Switch(config-if)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#
Switch#show vlan ?
  brief  VIP all VLAN status in brief
  id     VIP VLAN status by VLAN id
  name   VIP VLAN status by VLAN name
  <cr>
Switch#show vlan brief

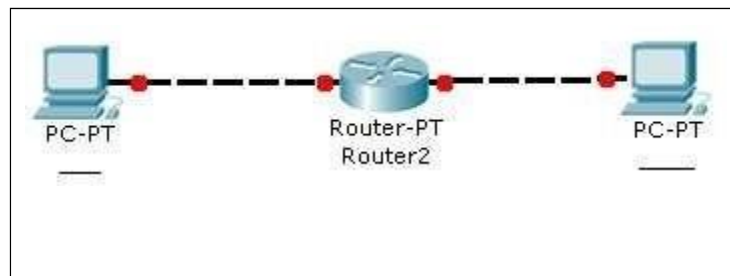
VLAN Name                Status    Ports
----
1    default                active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                           Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                           Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                           Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                           Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                           Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                           Gig0/1, Gig0/2

1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default        active
1005 ternet-default        active

Switch#
```

At which layer the SWITCH operates? \_\_\_\_\_

### Task#3: Understand Network Topology and network hardware (L3) devices.



### CONFIGURATION:

```
Router0
Physical Config CLI
IOS Command Line Interface

Press RETURN to get started!

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa 0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

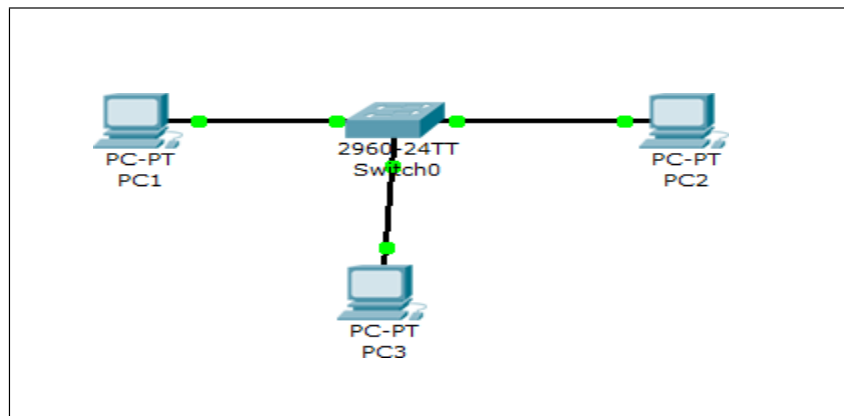
Router(config-if)#exit
Router(config)#int fa 0/1
Router(config-if)#ip address 11.0.0.1 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

Router(config-if)#exit
Router(config)#
Router(config)#
Router(config)#
Router(config)#
```

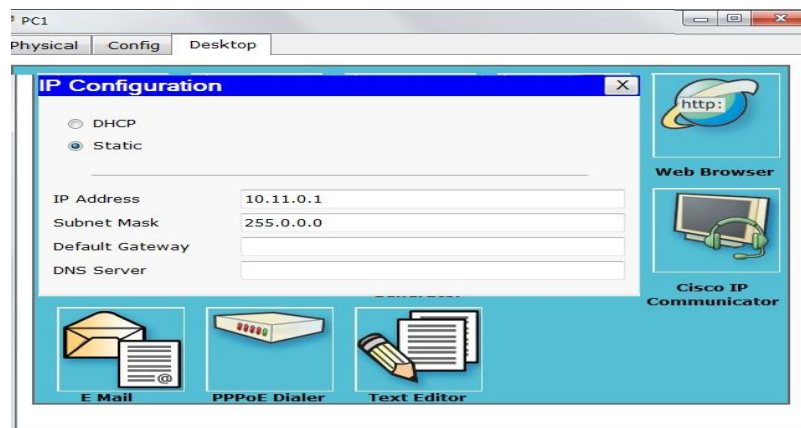
At which layer the ROUTER operates? \_\_\_\_\_

**Task#4: Start the packet tracer and configure the following network and show the packet header format of ICMP protocol.**

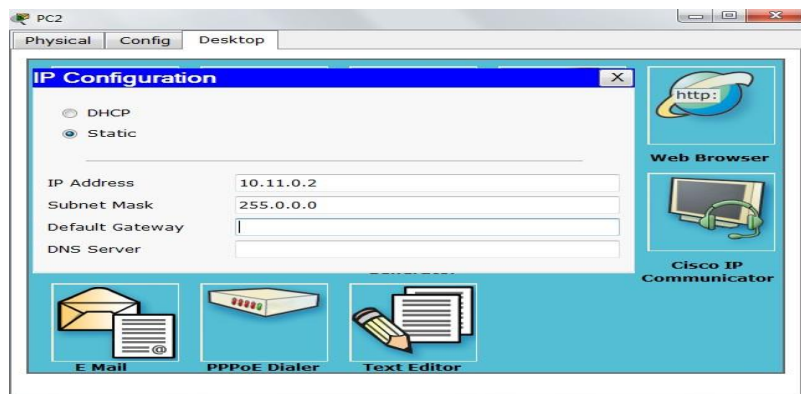


**Step#1: configure PC1.**

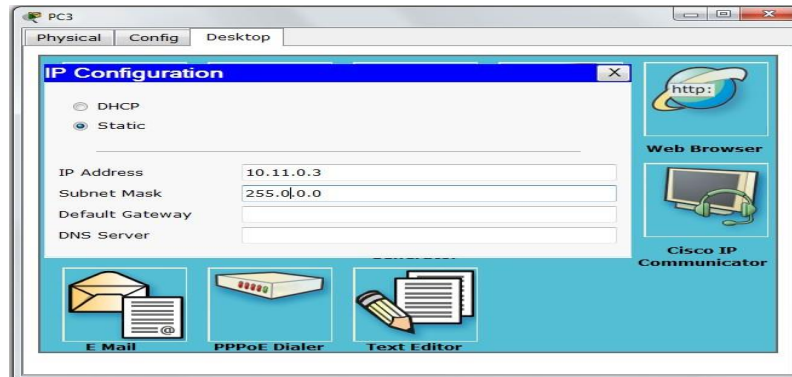
**a)Click on the PC1 and go to Desktop →IP Configuration**



**b)Click on the PC2 and go to Desktop →IP Configuration**



**c)Click on the PC3 and go to Desktop →IP Configuration**



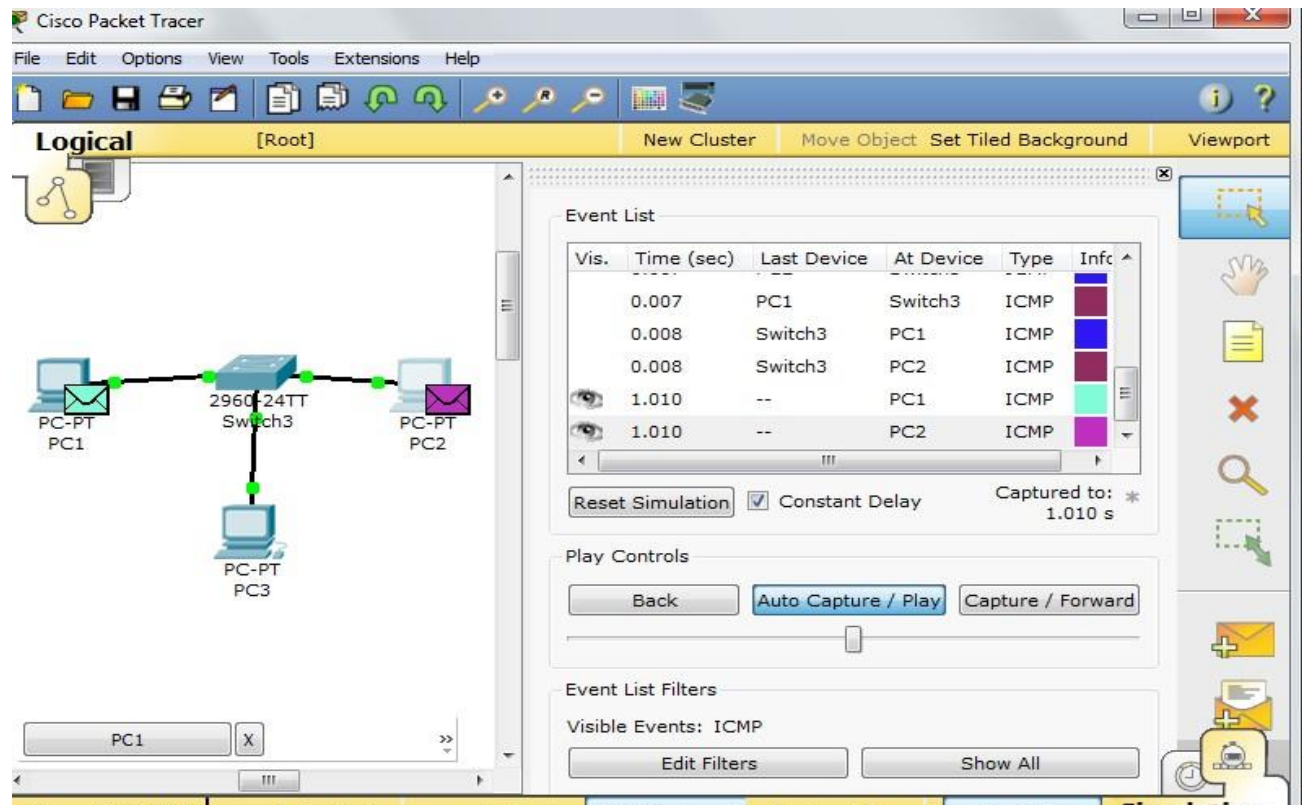
**Step#2:**

a)Now click on simulation icon in the right bottom of packet Tracer.

b)Now click on edit filter and to capture ICMP protocol packets, Click on ICMP check box.

c)Now click on auto capture /play icon for packet capturing.

d) Click on the PC1 and go to Desktop →Command Prompt then Ping PC1 from PC2.



**Step#3: Now click on the ICMP packet show its header.**

**a) Shows OSI layers involved in transmission.**

The popped up window (below) will enable you to trace the content of the message through the OSI layer and what changes will occur at each layer (use next and previous buttons to trace each layer content).

The screenshot shows a window titled "PDU Information at Device: PC2" with three tabs: "OSI Model", "Inbound PDU Details", and "Outbound PDU Details". The "OSI Model" tab is active, displaying the following information:

At Device: PC2  
Source: PC1  
Destination: 10.11.0.2

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer 3: IP Header Src. IP: 10.11.0.1, Dest. IP: 10.11.0.2 ICMP Message Type: 8
Layer 2: Ethernet II Header 0030.A30B.95A8 >> 000C.8561.C7A4
Layer 1: Port FastEthernet

**Out Layers**

Layer7
Layer6
Layer5
Layer4
Layer 3: IP Header Src. IP: 10.11.0.2, Dest. IP: 10.11.0.1 ICMP Message Type: 0
Layer 2: Ethernet II Header 000C.8561.C7A4 >> 0030.A30B.95A8
Layer 1: Port(s): FastEthernet

1. FastEthernet receives the frame.

**b) Shows Inbound PDU Details.**

The inbound tab shows the content of the message (header format) during the

The screenshot shows a window titled "PDU Information at Device: Switch3" with three tabs: "OSI Model", "Inbound PDU Details", and "Outbound PDU Details". The "Inbound PDU Details" tab is active, displaying the following information:

**Ethernet II**

0	4	8	14	19	Bytes
PREAMBLE: 101010...1011		DEST MAC: 0030.A30B.95A8		SRC MAC: 000C.8561.C7A4	
TYPE: 0x800		DATA (VARIABLE LENGTH)		FCS: 0x0	

**IP**

0	4	8	16	19	31	Bits
IHL: 5		DSCP: 0x0		TL: 128		
ID: 0xe		0x0		0x0		
TTL: 128		PRO: 0x1		CHKSUM		
SRC IP: 10.11.0.2						
DST IP: 10.11.0.1						
OPT: 0x0				0x0		
DATA (VARIABLE LENGTH)						

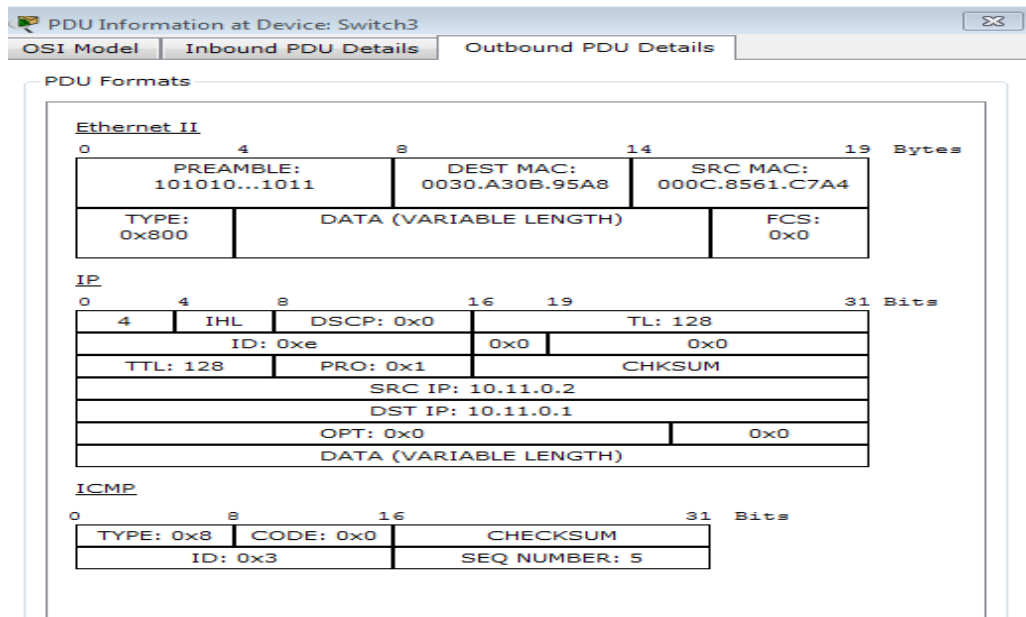
**ICMP**

0	8	16	31	Bits	
TYPE: 0x8		CODE: 0x0		CHECKSUM	
ID: 0x3		SEQ NUMBER: 5			

receiving process.

### c) Shows Outbound PDU Details.

The outbound tab shows the content of the message (header format) during the Sending process

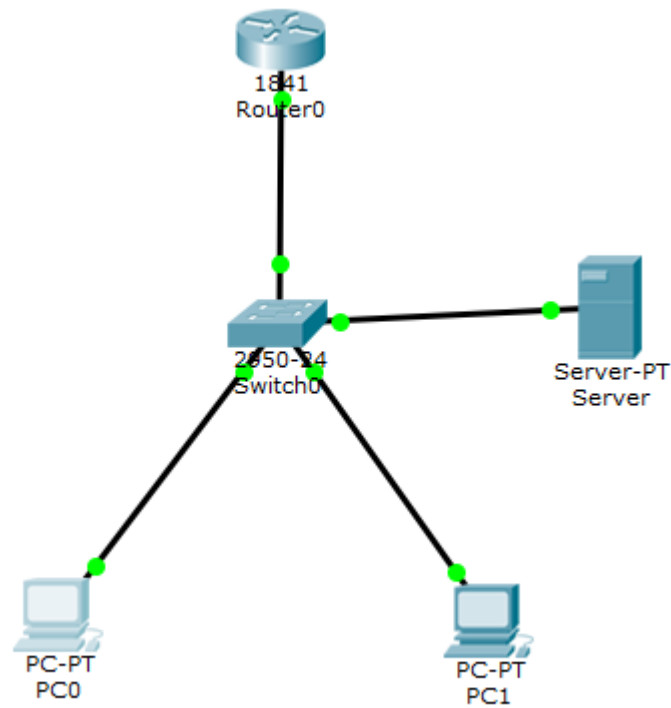


## Dynamic Host Configuration Protocol Using Router

The Dynamic Host Configuration Protocol is used by computers for requesting Internet Protocol parameters, such as an IP address from a network server. The protocol operates based on the client-server model. DHCP is very common in all modern networks ranging in size from home networks to large campus networks and regional Internet service provider networks. Most residential network routers receive a globally unique IP address within the provider network. Within a local network, DHCP assigns a local IP address to devices connected to the local network.

When a computer or other networked device connects to a network, its DHCP client software in the operating system sends a broadcast query requesting necessary information. Any DHCP server on the network may service the request. The DHCP server manages a pool of IP addresses and information about client configuration parameters such as default gateway, domain name, the name servers, time servers. On receiving a request, the server may respond with specific information for each client, as previously configured by an administrator, or with a specific address and any other information valid for the entire network, and the time period for which the allocation (*lease*) is valid. A host typically queries for this information immediately after booting, and periodically thereafter before the expiration of the information. When an assignment is refreshed by the client computer, it initially requests the same parameter values, but may be assigned a new address from the server, based on the assignment policies set by administrators.

We can use DHCP service from router as well as from Server.



Now configuring network on Fa 0/0.

```
Router1
Physical Config CLI
IOS Command Line Interface

Press RETURN to get started!

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTRL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown

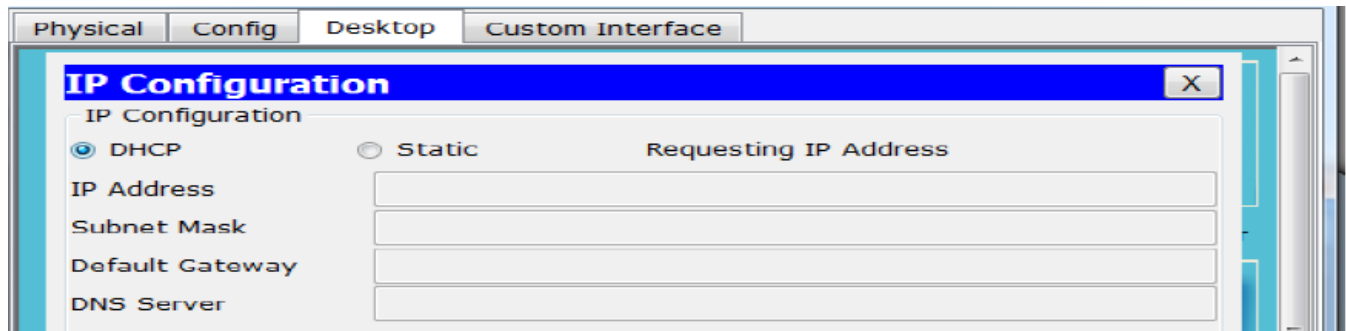
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#ip dhcp pool fast
Router(dhcp-config)#network 10.0.0.0 255.0.0.0
Router(dhcp-config)#default-router 10.0.0.1
Router(dhcp-config)#dns-server 192.168.10.2
Router(dhcp-config)#ip dhcp excluded-address 10.0.0.1 10.0.0.5
Router(dhcp-config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

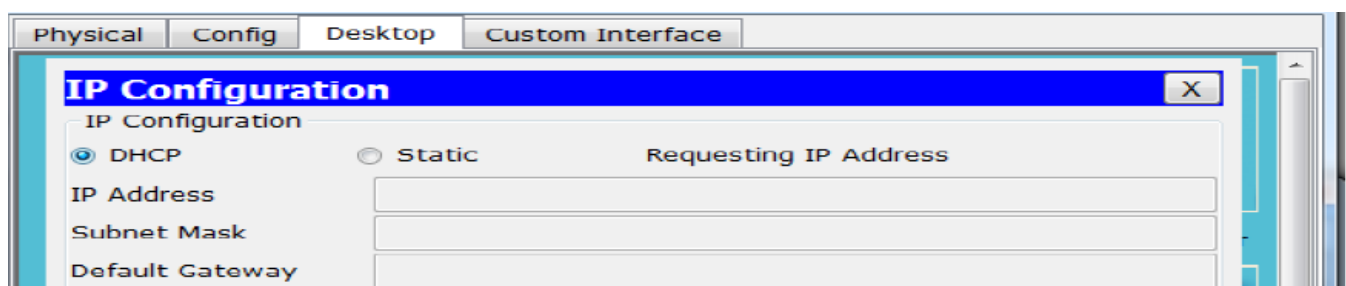
Router#
```



## Now assigning IP to PC0 and PC1



The screenshot shows a window titled "IP Configuration" with a close button (X) in the top right corner. The window has four tabs: "Physical", "Config", "Desktop", and "Custom Interface". The "Config" tab is selected. Inside the window, there is a section labeled "IP Configuration" with a sub-label "IP Configuration". Below this, there are two radio buttons: "DHCP" (which is selected) and "Static". To the right of the "Static" radio button, the text "Requesting IP Address" is displayed. Below the radio buttons, there are four text input fields labeled "IP Address", "Subnet Mask", "Default Gateway", and "DNS Server". All four fields are currently empty.



This screenshot is identical to the one above, showing the "IP Configuration" window with the "Config" tab selected. The "DHCP" radio button is selected, and the "Static" radio button is unselected. The text "Requesting IP Address" is visible to the right of the "Static" radio button. The four text input fields for "IP Address", "Subnet Mask", "Default Gateway", and "DNS Server" are all empty.

