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## Experiment 7

**Student Name: Deepak Saini**

**UID: 20BCS4066**

**Branch: 20BCC1**

**Section/Group: A**

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**Subject Name: Computer Network Lab**

**Subject Code: 20CSP-342**

### 1. Aim/Overview of the practical:

Implement Router as DHCP server that can serve multiple VLAN's.

1. Use 3 VLANS HR, SALES, IT
2. Implement Router as DHCP server
3. Communicate among all the VLANs

### 2. Requirements:

PC, Cisco Packet Tracer.

### 3. Theory:

**Virtual Local Area Network:** Virtual LAN (VLAN) is a concept in which we can divide the devices logically on data Link Layer i.e. (Layer2). Generally, Network Layer (layer 3) devices divides broadcast domain and each broadcast domain can be divided by switches using the concept of VLAN. A broadcast domain is a network segment in which if a device broadcast a packet, then all the devices in the same network will receive it. However, due to limitations of switches packets don't send outside the broadcast network. To forward out the packets to different VLAN (from one VLAN to another) or broadcast domain, inter VLAN routing is needed. Through VLAN, different small size sub networks are created which are comparatively easy to handle.

- A **DHCP Server** is a network server that automatically provides and assigns IP addresses, default gateways and other network parameters to client devices.
- **Without it**, the network administrator must manually set up every client that joins the network, which can be cumbersome, especially in large networks

#### 4. Steps for experiment:

1. Select 6 end devices.
2. Now click on network devices and select 1 switch (Switch-2960).
3. Connect all the 4 PCs to the switch with the help of Auto Connect cable/ Copper straight through cable.
4. Now draw 3 regions to create difference between the PCs that is assigned to different departments.
5. Click on switch and move to CLI for the configuration of VLAN.
6. Configure the Switch and Router with the commands below.

```
switch# enable
switch# configure terminal
switch (config)#vlan 10
switch(config-vlan)#name HR
switch (config)#vlan 20
switch(config-vlan)#name SALES
switch (config)#vlan 30
switch(config-vlan)#name IT
Switch(config)#int range fa0/1-2
Switch(config-if-range) #switchport mode Access
Switch(config-if-range) #switchport access vlan 10
Switch(config-if-range) #exit

Switch(config)#int fa0/3-4
Switch(config-if-range) #switchport mode Access
Switch(config-if-range) #switchport access vlan 20
Switch(config-if-range) #exit

Switch(config)#int fa0/5-6
Switch(config-if-range) #switchport mode Access
Switch(config-if-range) #switchport access vlan 30
Switch(config-if-range) #exit

Switch(config)#int fa0/7
Switch(config-if) #switchport mode Trunk
```

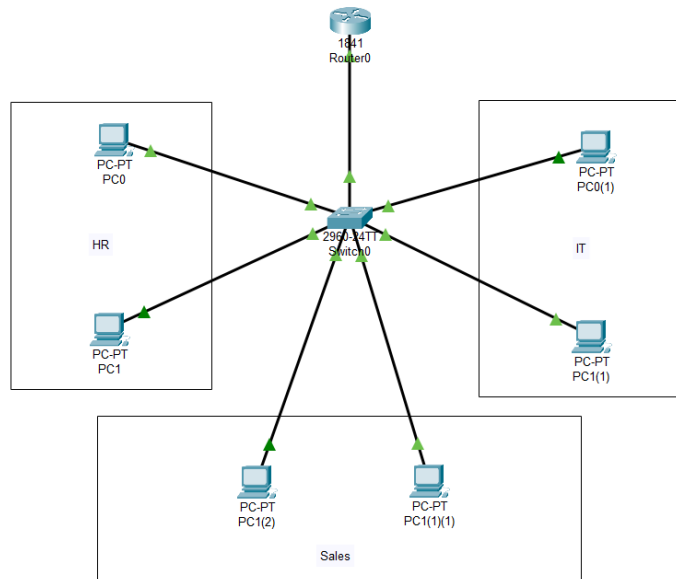
```
Router>en
Router#config t
Router(config)#int fa0/0
Router(config-if)#no shutdown
Router(config-if)#int fa 0/0.10
Router(config-subif)#
Router(config-subif)#encapsulat on dot1q 10
Router(config-subif)#ip add 10.0.0.1 255.255.255.192
Router(config-subif)#int fa 0/0.20
Router(config-subif)#encapsulat on dot1q 20
Router(config-subif)#ip add 10.0.0.65 255.255.255.192
Router(config-subif)#int fa 0/0.30
Router(config-subif)#encapsulat on dot1q 30
Router(config-subif)#ip add 10.0.0.129 255.255.255.192
Router(config-subif)#exit
```

```
Router(config)#ip dhcp pool VLAN10
Router(dhcp-config)#network 10.0.0.0 255.255.255.192
Router(dhcp-config)#default-router 10.0.0.1
Router(dhcp-config)#ip dhcp excluded-address 10.0.0.1
Router(config)#ip dhcp pool VLAN20
Router(dhcp-config)#ip dhcp pool VLAN20
Router(dhcp-config)#network 10.0.0.64 255.255.255.192
Router(dhcp-config)#default-router 10.0.0.65
Router(dhcp-config)#ip dhcp excluded-address 10.0.0.65
Router(config)#ip dhcp pool VLAN30
Router(dhcp-config)#network 10.0.0.128 255.255.255.192
Router(dhcp-config)#default-router 10.0.0.129
Router(dhcp-config)#ip dhcp excluded-address 10.0.0.129
Router(config)#exit
Router#sh ip dhcp pool
```

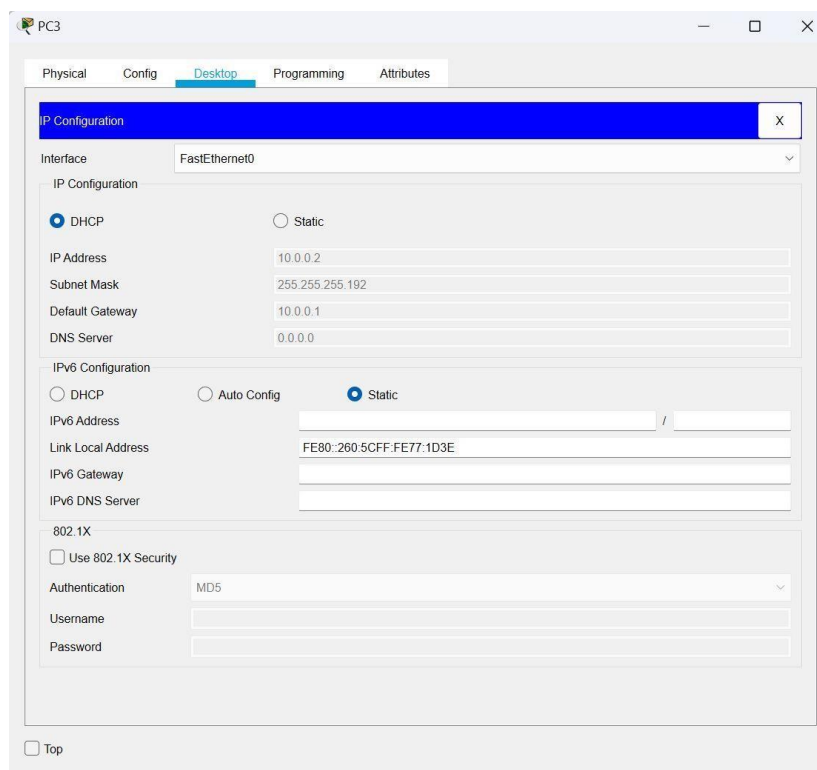
## 5. Result/Output:

Connect all the devices

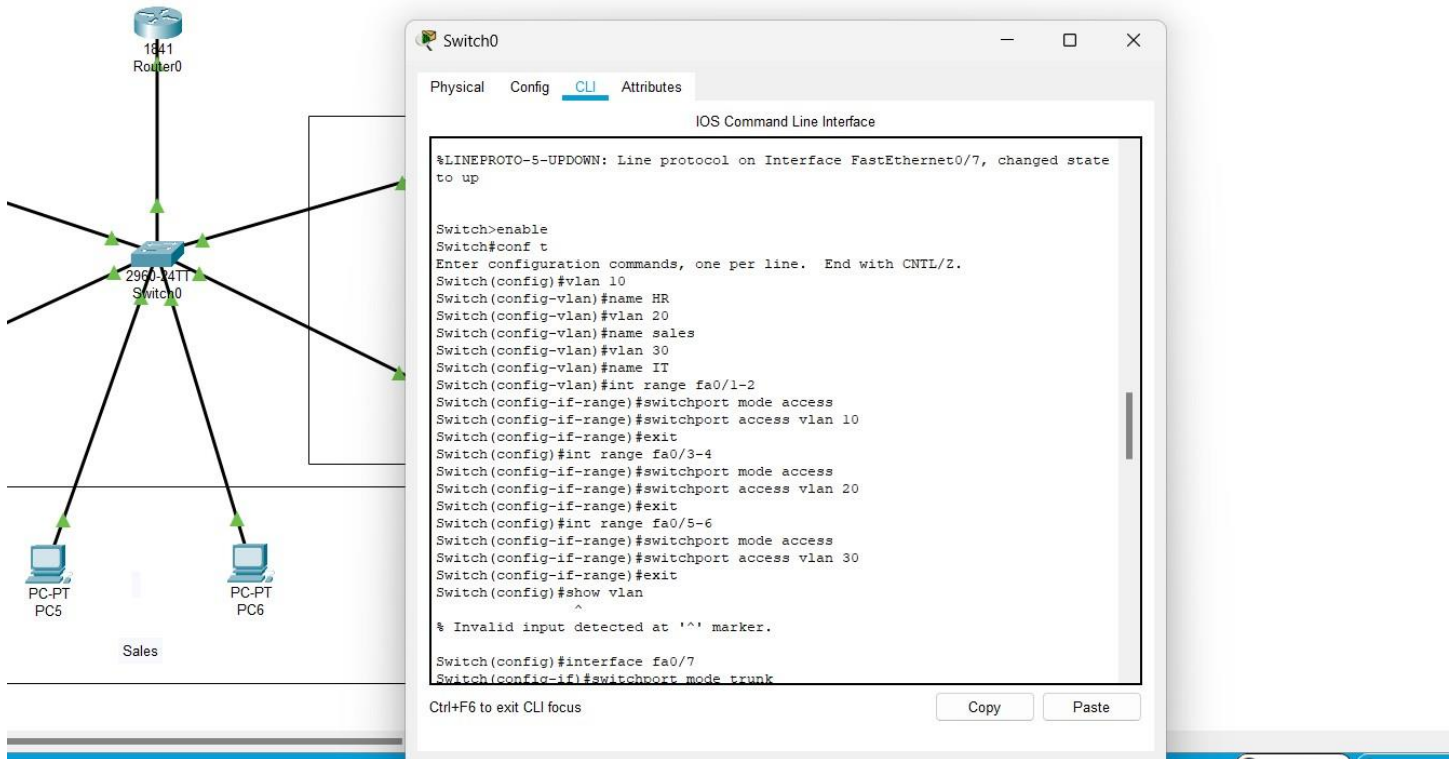
a) x: 1339, y: 427



Enable dhcp in every end device. It will automatically assign IP address and gateway.

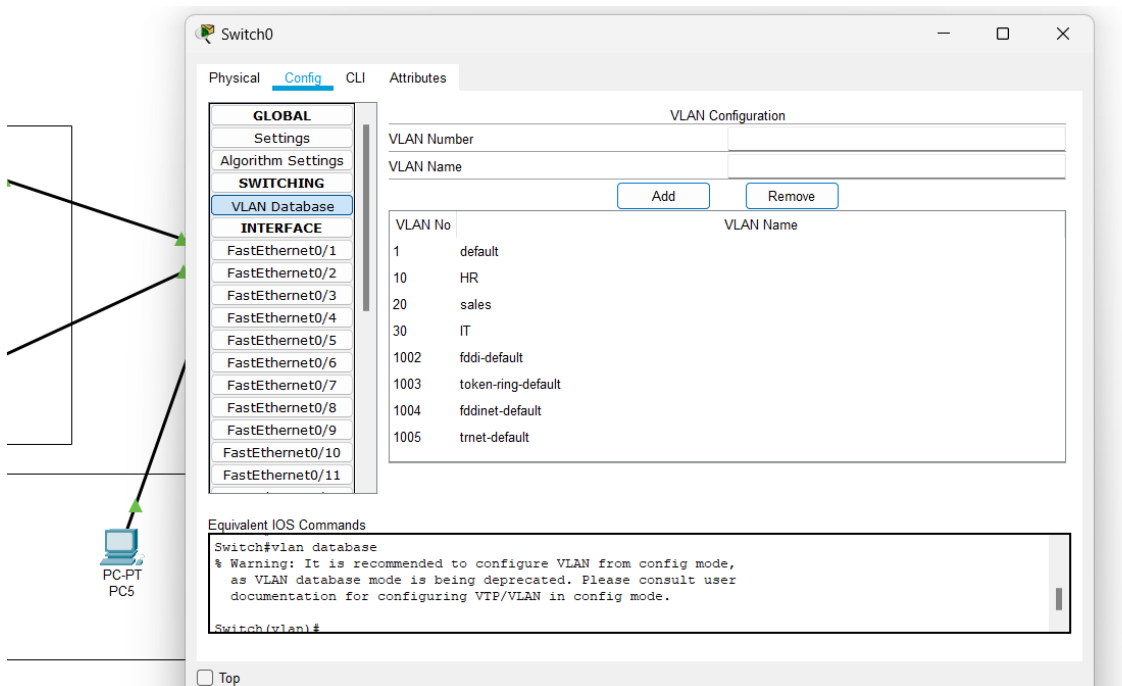


## Configured the Switch with given commands



The network diagram shows a central switch (Switch0) connected to a router (1041 Router0) and two PCs (PC5, PC6). The switch is configured with the following commands:

```
Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name HR
Switch(config-vlan)#vlan 20
Switch(config-vlan)#name sales
Switch(config-vlan)#vlan 30
Switch(config-vlan)#name IT
Switch(config-vlan)#int range fa0/1-2
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#exit
Switch(config)#int range fa0/3-4
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#exit
Switch(config)#int range fa0/5-6
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 30
Switch(config-if-range)#exit
Switch(config)#show vlan
^
% Invalid input detected at '^' marker.
Switch(config)#interface fa0/7
Switch(config-if)#switchport mode trunk
```



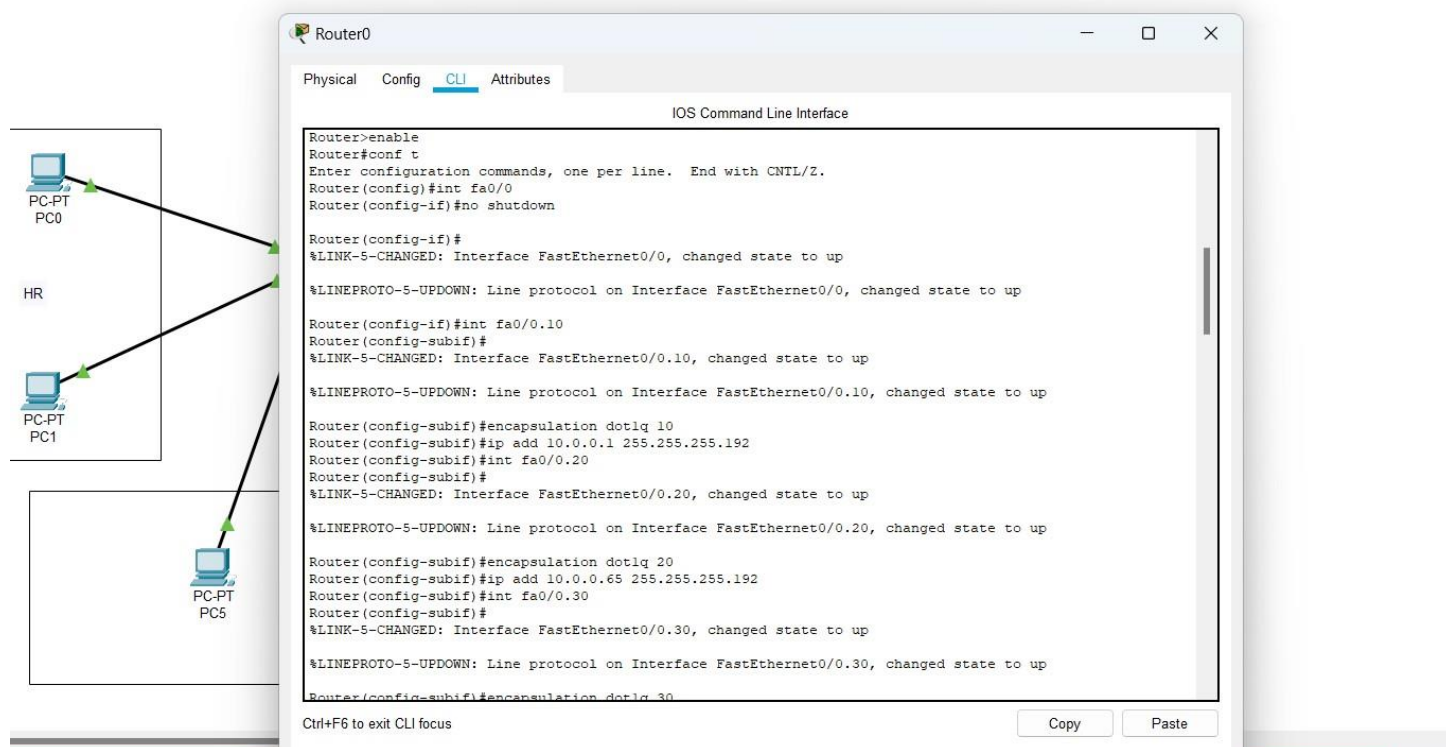
The Switch0 Config window shows the VLAN Configuration section. The VLAN Database is displayed as follows:

VLAN No	VLAN Name
1	default
10	HR
20	sales
30	IT
1002	fdi-default
1003	token-ring-default
1004	fdinet-default
1005	trnet-default

Equivalent IOS Commands:

```
Switch#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.
Switch(vlan)#
```

Configured the router with given commands to enable VLAN and as DHCP server



The screenshot shows a Packet Tracer workspace with a network topology on the left and the Router0 configuration window on the right.

**Network Topology:**

- Three PCs (PC-PT PC0, PC-PT PC1, PC-PT PC5) are connected to a central switch labeled 'HR'.
- The switch 'HR' is connected to the 'fa0/0' interface of Router0.

**Router0 Configuration (CLI):**

```

Router>enable
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
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)#int fa0/0.10
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.10, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.10, changed state to up

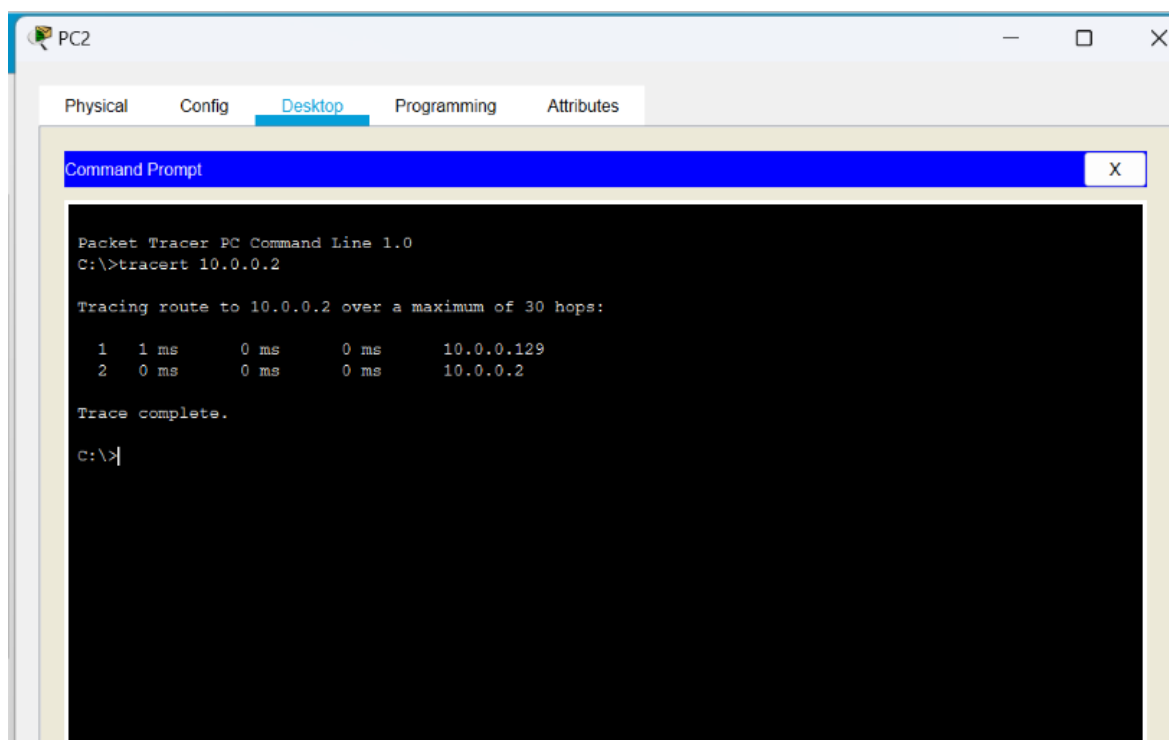
Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip add 10.0.0.1 255.255.255.192
Router(config-subif)#int fa0/0.20
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20, changed state to up

Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip add 10.0.0.65 255.255.255.192
Router(config-subif)#int fa0/0.30
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.30, changed state to up

Router(config-subif)#encapsulation dot1q 30

```

Ping the message with the help of 'ping' command on Command Prompt



The screenshot shows the 'PC2' window in Packet Tracer with the 'Desktop' tab selected. A 'Command Prompt' window is open, displaying the output of a 'tracert' command.

**Command Prompt Output:**

```

Packet Tracer PC Command Line 1.0
C:\>tracert 10.0.0.2

Tracing route to 10.0.0.2 over a maximum of 30 hops:

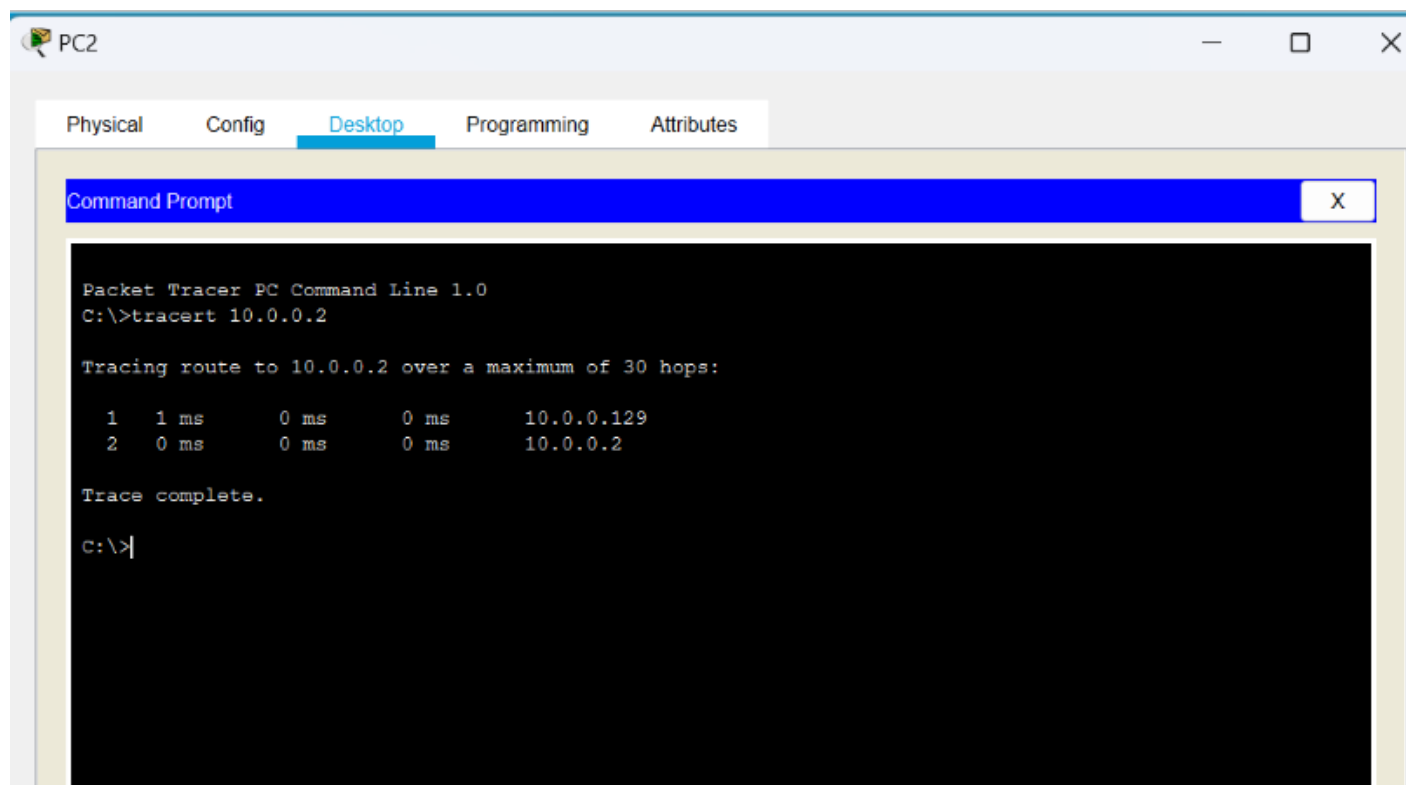
  1  1 ms    0 ms    0 ms    10.0.0.129
  2  0 ms    0 ms    0 ms    10.0.0.2

Trace complete.
c:\>

```



Used command 'tracert' to route the path of communication between two end devices



### Learning outcomes (What I have learnt):

- Leant how VLAN is created using simple connection.
- Learnt that how a router can be used as a dhcp server with the help of certain commands.
- How to troubleshoot the network.
- Learnt to route the different networks.

**Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):**

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			