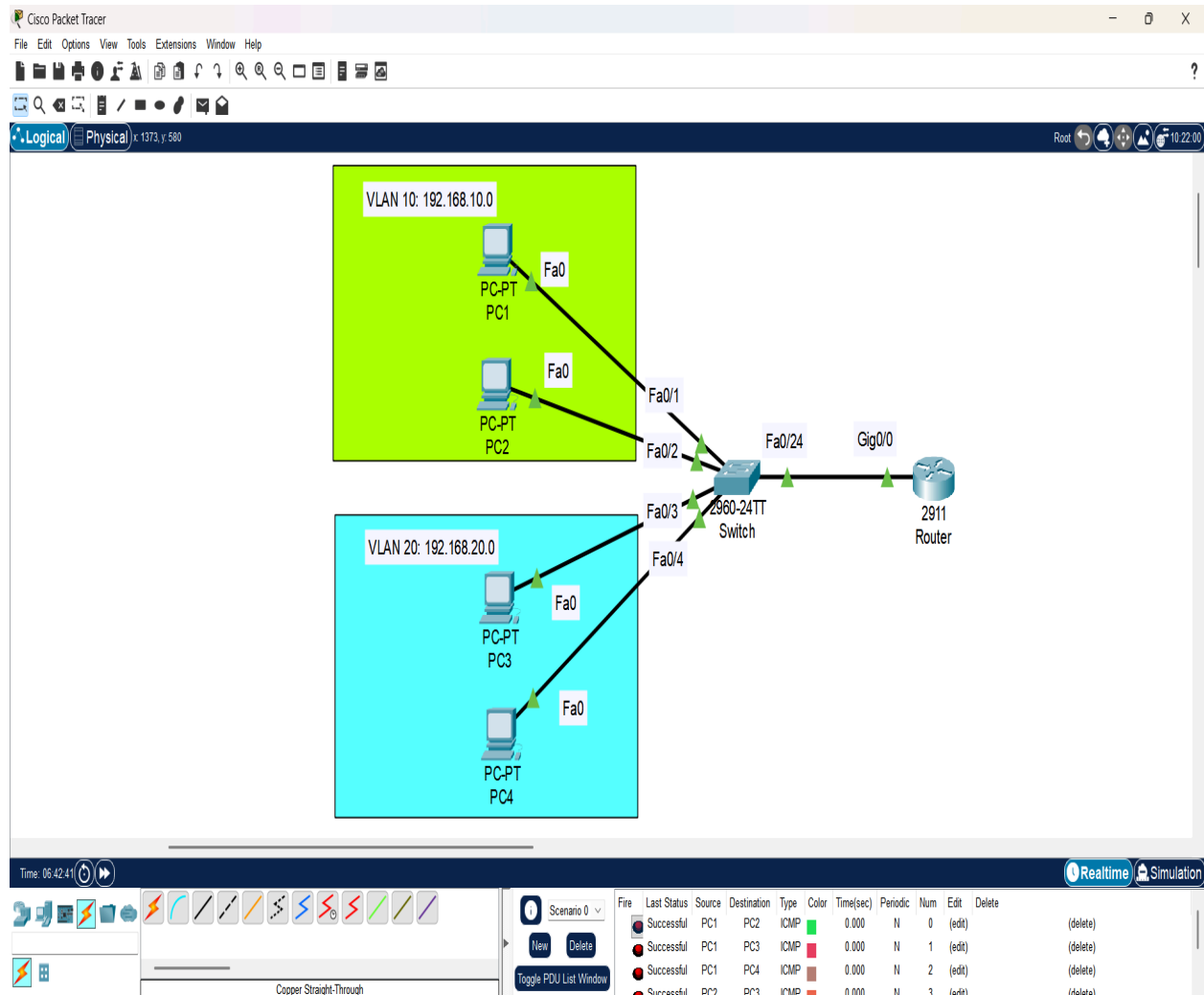


Objective:

Configure a router to provide DHCP services to multiple VLANs using router-on-a-stick.

Topology:


Router connected to switch via trunk port. Two VLANs on the switch.



VLAN Design:

VLAN 10 (SALES)

VLAN 20 (IT)

 Switch

Physical

Config

CLI

Attributes

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%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
%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed state to up

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name SALES
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name IT
Switch(config-vlan)#exit
Switch(config)#interface 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)#interface 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)#interface fa0/24
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#end
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#
```

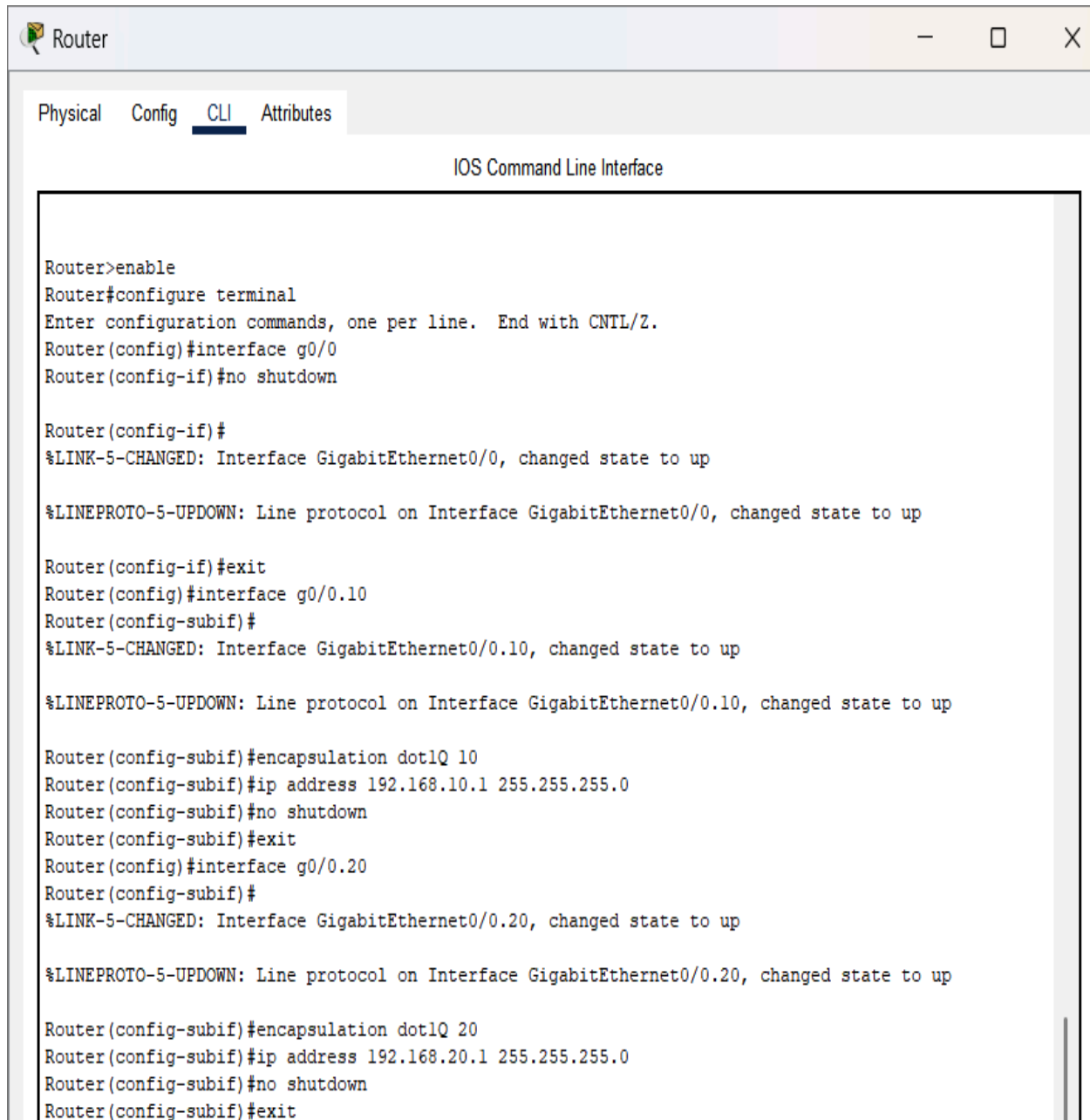
Copy

Paste

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Router Sub-Interface Configuration

- The router interface port is configured into subinterfaces to serve as VLAN gateways
- All these VLANs are contained in the TRUNK



```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface g0/0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#interface g0/0.10
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.10, changed state to up

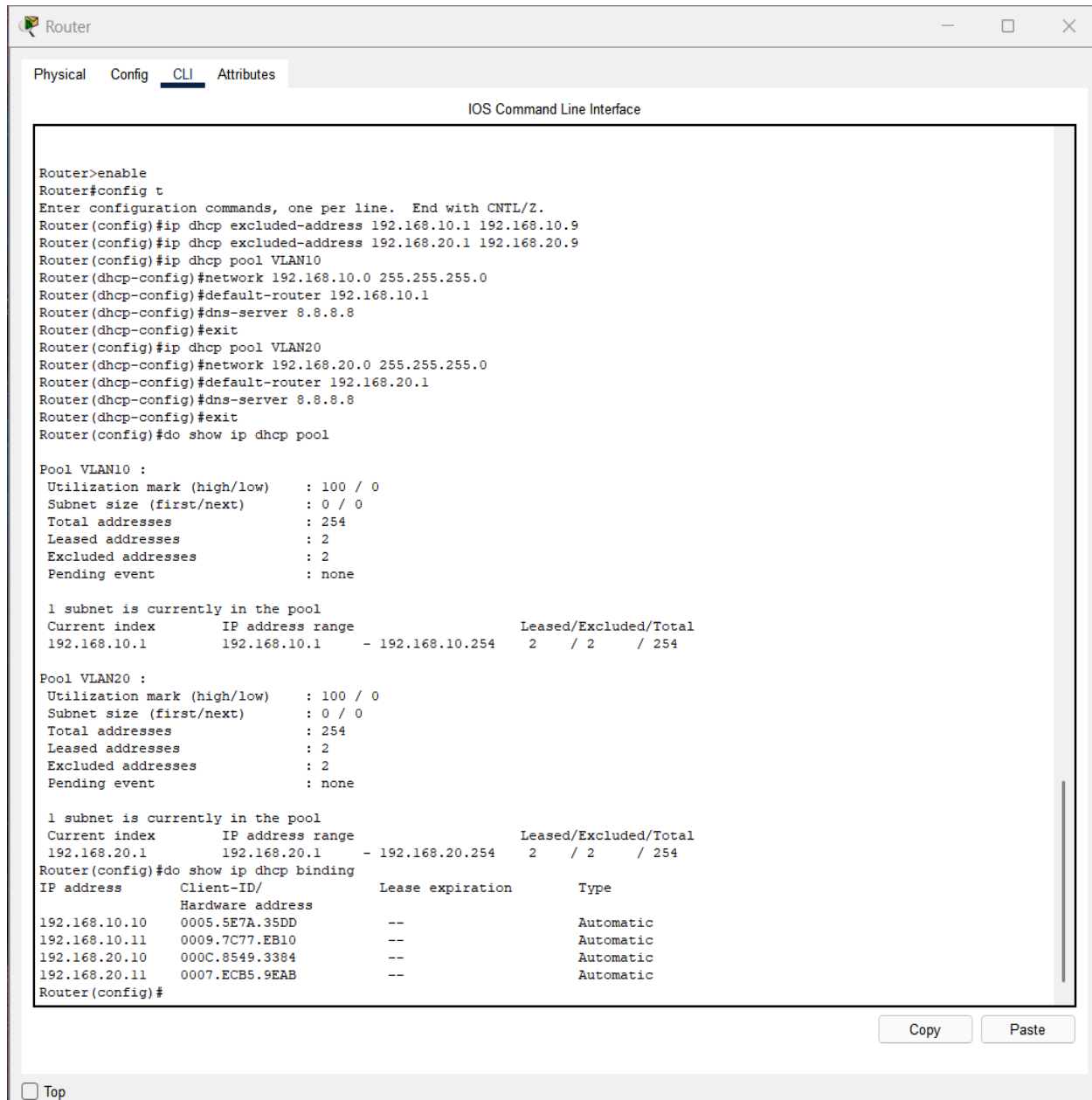
Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip address 192.168.10.1 255.255.255.0
Router(config-subif)#no shutdown
Router(config-subif)#exit
Router(config)#interface g0/0.20
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.20, changed state to up

Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip address 192.168.20.1 255.255.255.0
Router(config-subif)#no shutdown
Router(config-subif)#exit
```

DHCP Configuration:

- Excluded gateway IPs
- DHCP pools created for VLAN 10 and VLAN 20
- Default gateways configured
- DNS server configured



The screenshot shows a Router CLI window with the following content:

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp excluded-address 192.168.10.1 192.168.10.9
Router(config)#ip dhcp excluded-address 192.168.20.1 192.168.20.9
Router(config)#ip dhcp pool VLAN10
Router(dhcp-config)#network 192.168.10.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.10.1
Router(dhcp-config)#dns-server 8.8.8.8
Router(dhcp-config)#exit
Router(config)#ip dhcp pool VLAN20
Router(dhcp-config)#network 192.168.20.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.20.1
Router(dhcp-config)#dns-server 8.8.8.8
Router(dhcp-config)#exit
Router(config)#do show ip dhcp pool
```

Pool VLAN10 :

| | |
|-----------------------------|-----------|
| Utilization mark (high/low) | : 100 / 0 |
| Subnet size (first/next) | : 0 / 0 |
| Total addresses | : 254 |
| Leased addresses | : 2 |
| Excluded addresses | : 2 |
| Pending event | : none |

1 subnet is currently in the pool

| Current index | IP address range | Leased/Excluded/Total |
|---------------|-------------------------------|-----------------------|
| 192.168.10.1 | 192.168.10.1 - 192.168.10.254 | 2 / 2 / 254 |

Pool VLAN20 :

| | |
|-----------------------------|-----------|
| Utilization mark (high/low) | : 100 / 0 |
| Subnet size (first/next) | : 0 / 0 |
| Total addresses | : 254 |
| Leased addresses | : 2 |
| Excluded addresses | : 2 |
| Pending event | : none |

1 subnet is currently in the pool

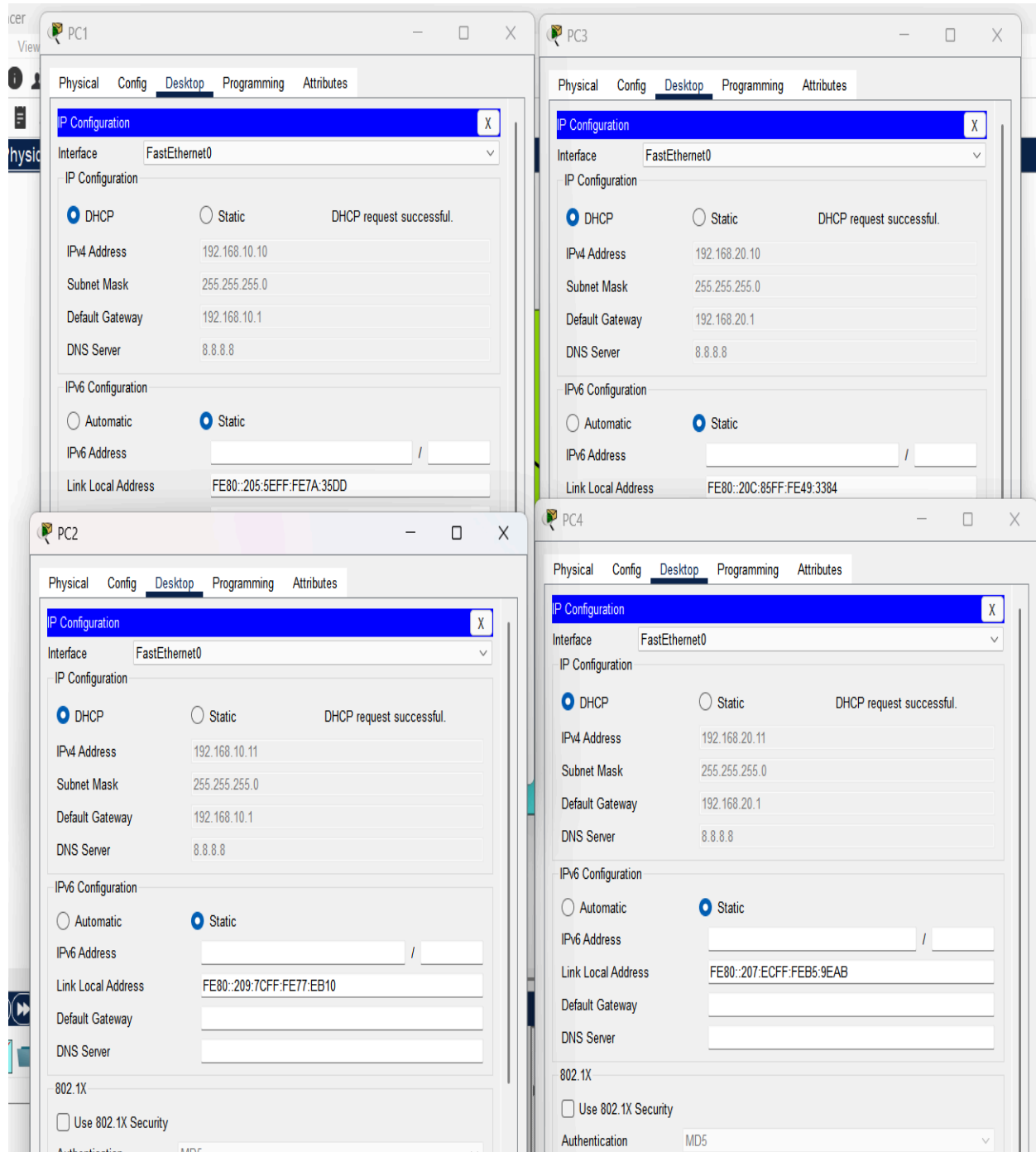
| Current index | IP address range | Leased/Excluded/Total |
|---------------|-------------------------------|-----------------------|
| 192.168.20.1 | 192.168.20.1 - 192.168.20.254 | 2 / 2 / 254 |

```
Router(config)#do show ip dhcp binding
IP address      Client-ID/      Lease expiration    Type
                Hardware address
192.168.10.10    0005.5E7A.35DD  --                  Automatic
192.168.10.11    0009.7C77.EB10  --                  Automatic
192.168.20.10    000C.8549.3384  --                  Automatic
192.168.20.11    0007.ECB5.9EAB  --                  Automatic
Router(config)#
```

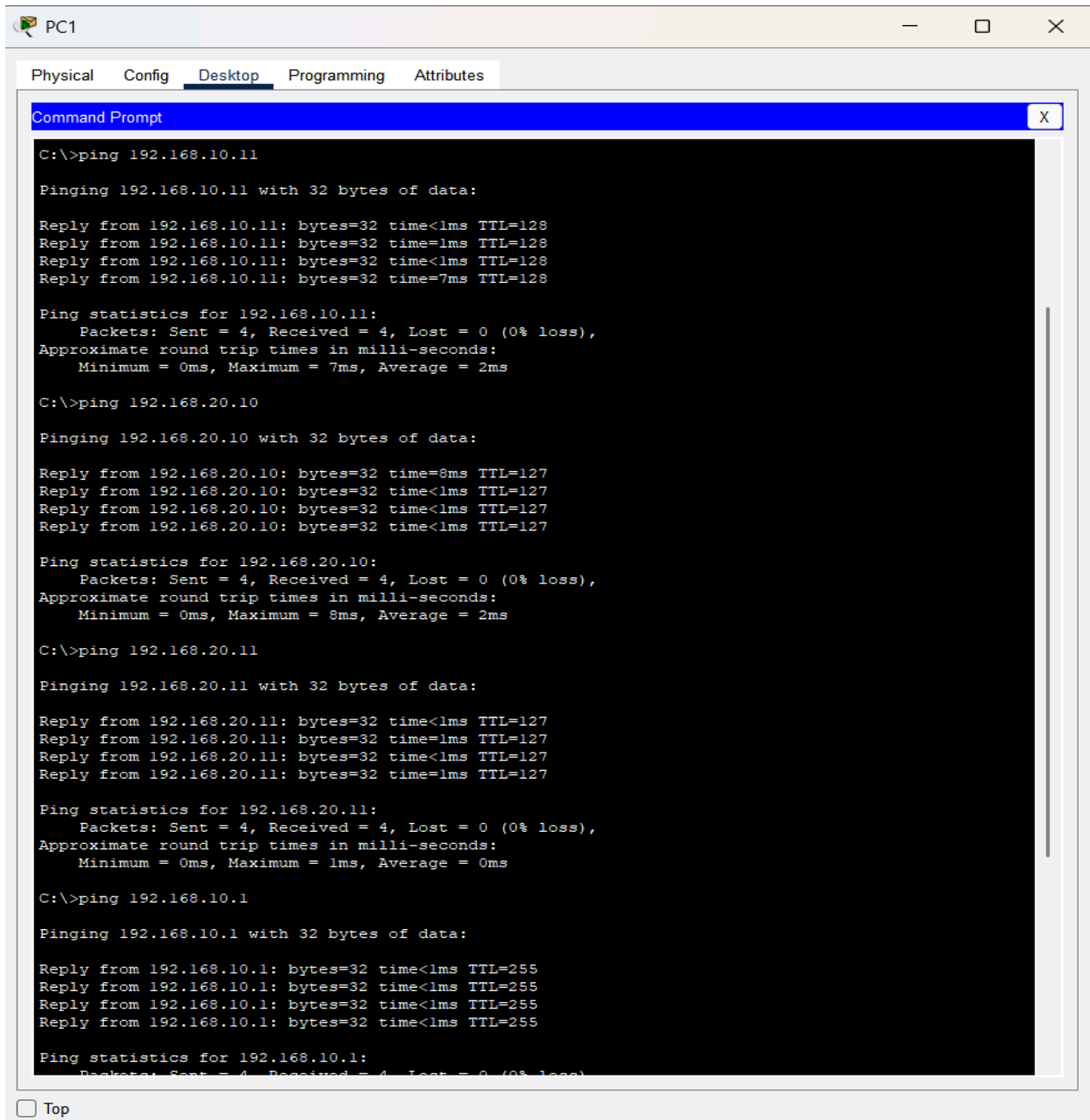
At the bottom of the window, there is a "Top" button and a "Copy/Paste" section with "Copy" and "Paste" buttons.

Verification:

- PCs receive IP addresses automatically



- Inter-VLAN ping successful



The screenshot shows a PC1 window with a Command Prompt. The Command Prompt has a blue title bar and a black background with white text. It displays the results of four ping commands: ping 192.168.10.11, ping 192.168.20.10, ping 192.168.20.11, and ping 192.168.10.1. Each command shows four successful replies with 32 bytes of data, and the ping statistics indicate 0% loss.

```
C:\>ping 192.168.10.11

Pinging 192.168.10.11 with 32 bytes of data:

Reply from 192.168.10.11: bytes=32 time<1ms TTL=128
Reply from 192.168.10.11: bytes=32 time<1ms TTL=128
Reply from 192.168.10.11: bytes=32 time<1ms TTL=128
Reply from 192.168.10.11: bytes=32 time=7ms TTL=128

Ping statistics for 192.168.10.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 7ms, Average = 2ms

C:\>ping 192.168.20.10

Pinging 192.168.20.10 with 32 bytes of data:

Reply from 192.168.20.10: bytes=32 time=8ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 8ms, Average = 2ms

C:\>ping 192.168.20.11

Pinging 192.168.20.11 with 32 bytes of data:

Reply from 192.168.20.11: bytes=32 time<1ms TTL=127
Reply from 192.168.20.11: bytes=32 time<1ms TTL=127
Reply from 192.168.20.11: bytes=32 time<1ms TTL=127
Reply from 192.168.20.11: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

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Lessons Learned:

- Routers can act as DHCP servers
- Separate DHCP pools are required per VLAN
- DHCP simplifies host configuration