



Computer Networks Lab

ASSIGNMENT 6

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BCSE - UG III

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Overview

Cisco Packet Tracer is one of the most useful visual simulation programs for networking certifications. With this tool, students are able to experiment with network behavior. As such, they're able to ask a wide range of questions and explore different scenarios for better results. Since Cisco Packet Tracer is an important part of the Networking Academy, it provides students with an extensive learning experience. Additionally, it offers several visualization, simulation, assessment, collaboration, and authoring capabilities to facilitate hassle-free learning and teaching of complex IT concepts.

Goals

Install the Cisco Packet Tracer in the local machine and simulate the different network configurations as given in the questions.

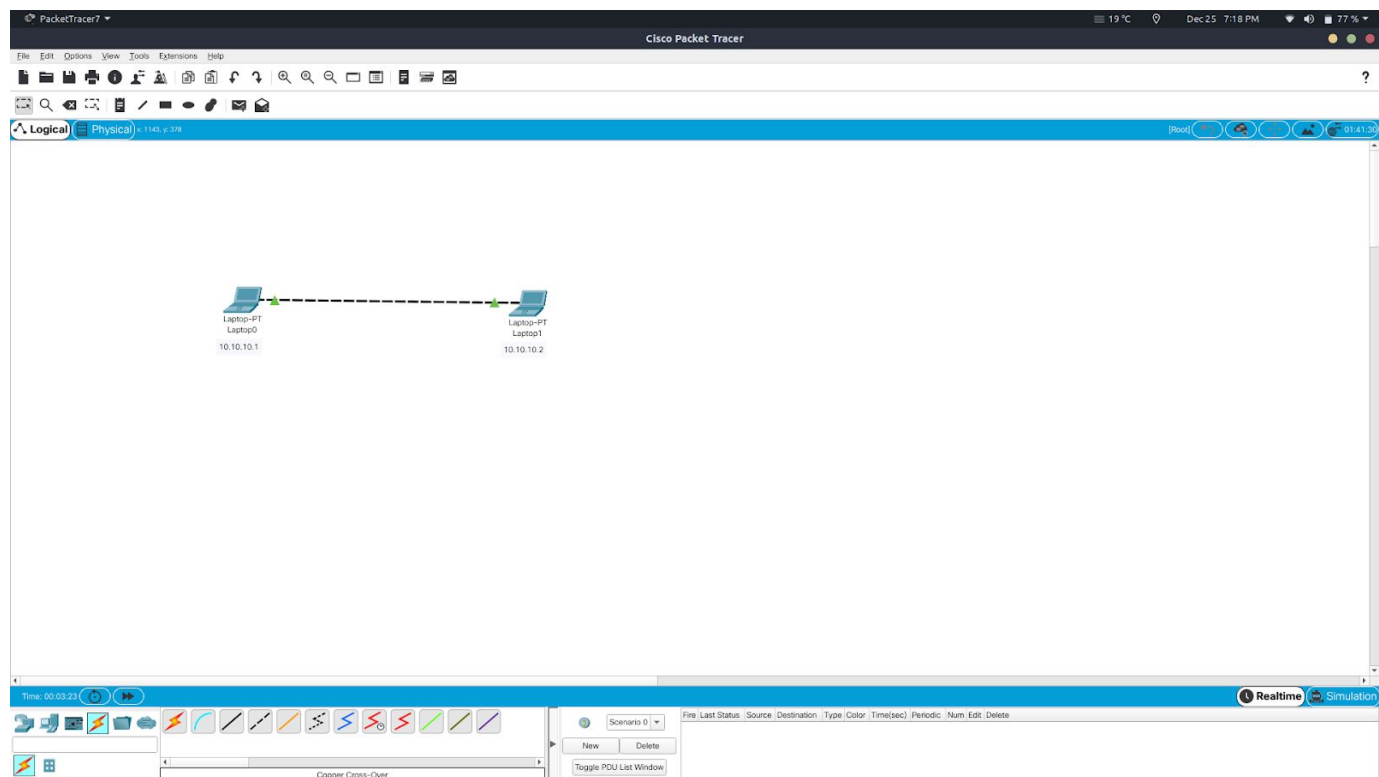
Specifications

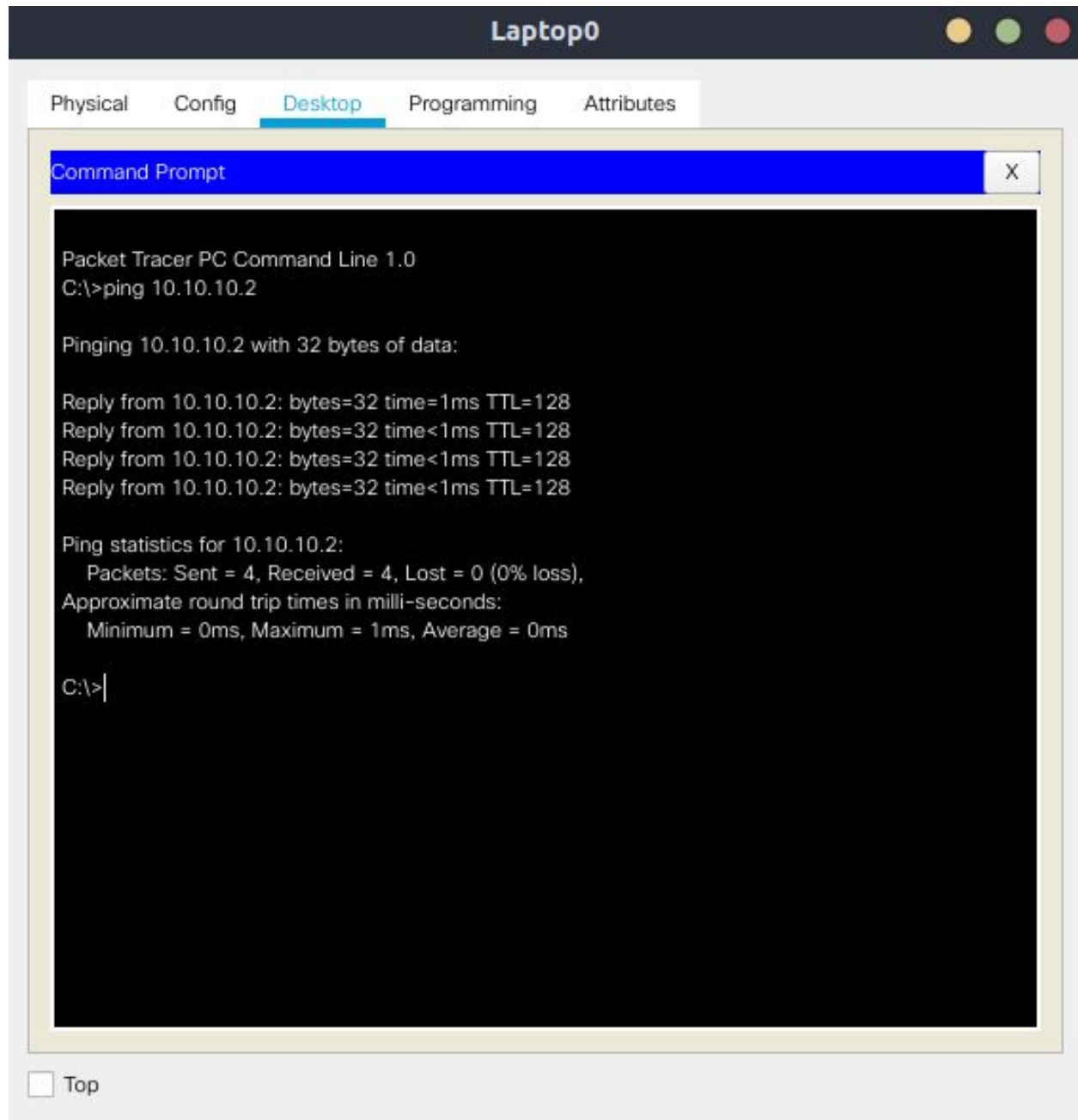
1. System - Linux
2. OS - Ubuntu 20.10
3. Packet Tracer - Cisco Packet Tracer 7.3.1

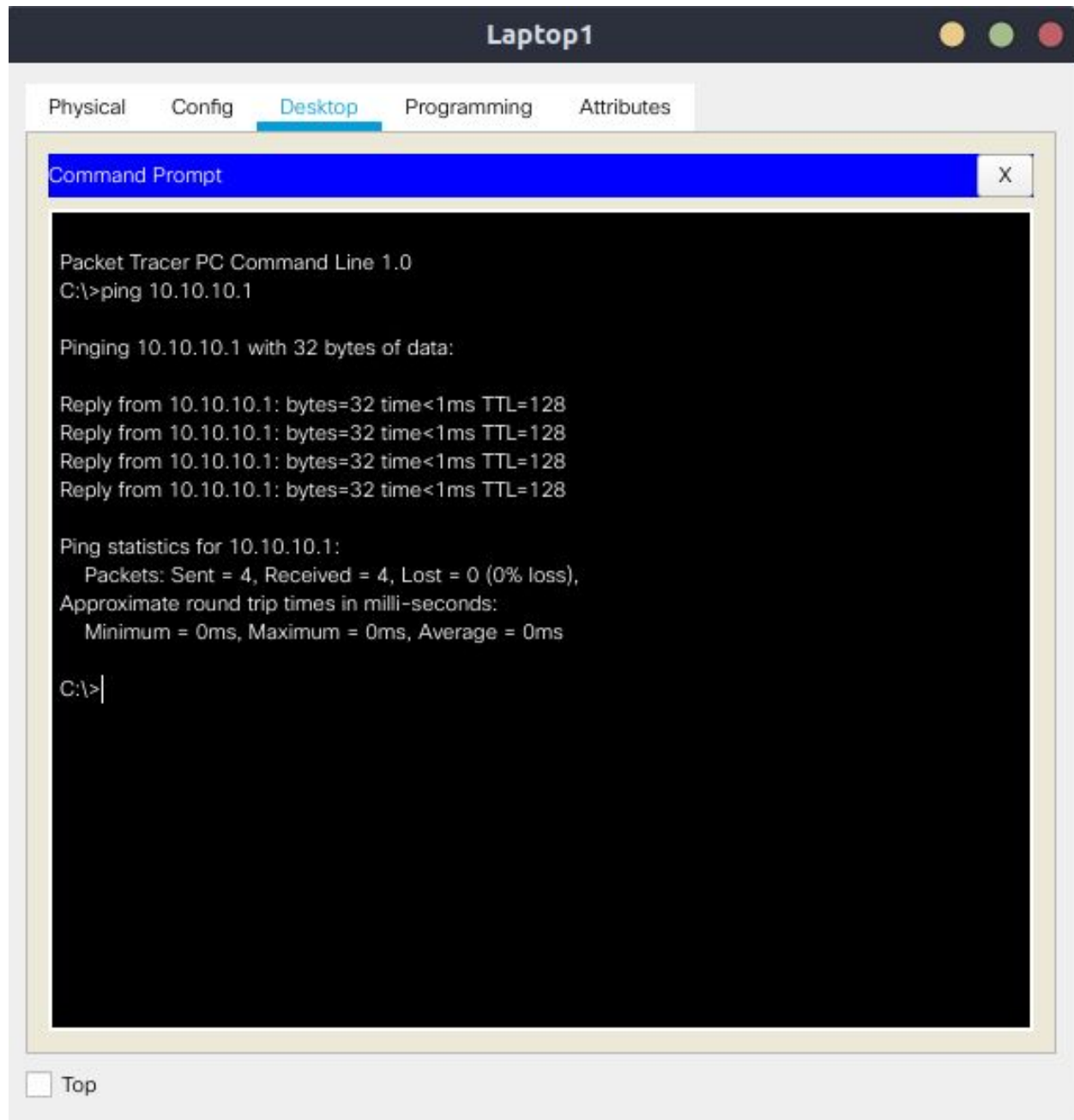
Questions and Solutions

Q1. Connect two hosts back-to-back with a crossover cable. Assign IP addresses, and see whether they are able to ping each other.

Two hosts were made and connected with a crossover cable. The IP addresses assigned to them were 10.10.10.1 and 10.10.10.2. The following results were obtained.

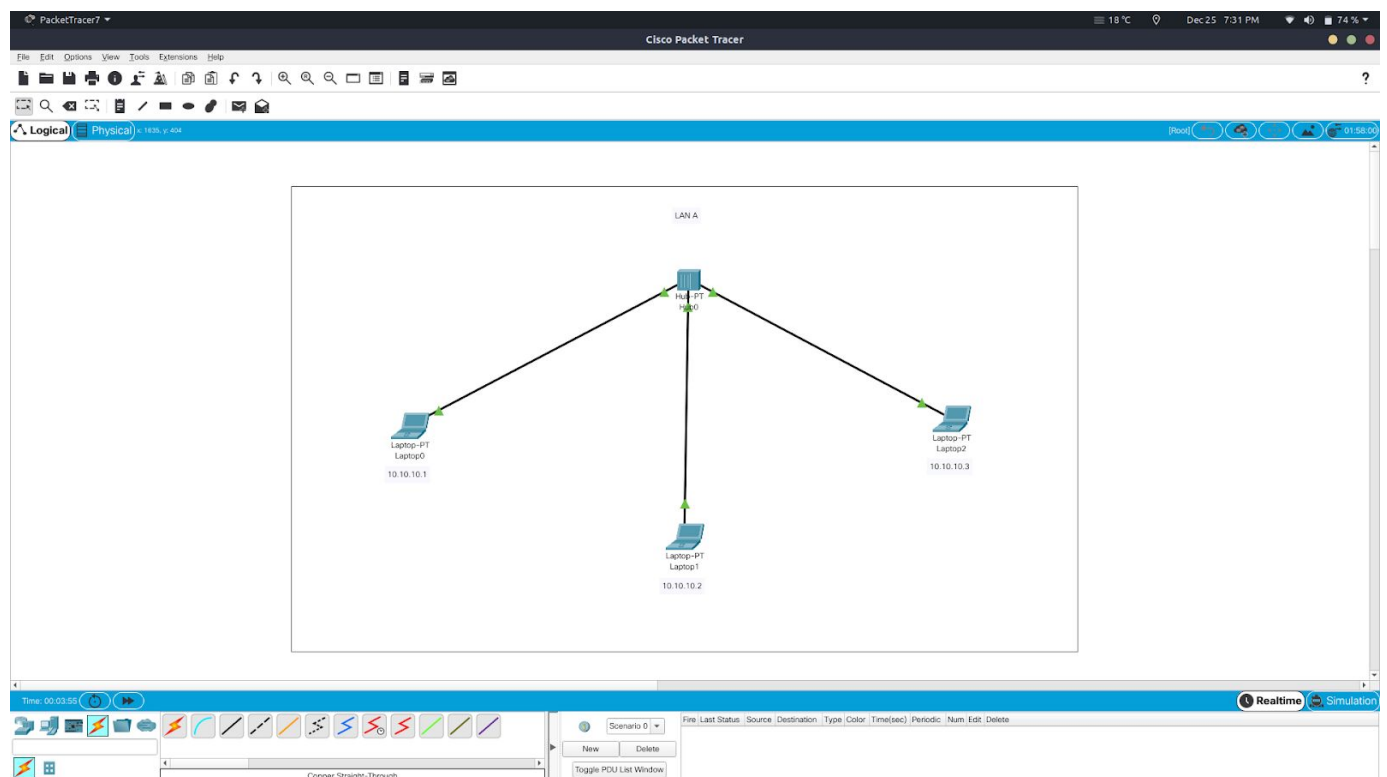


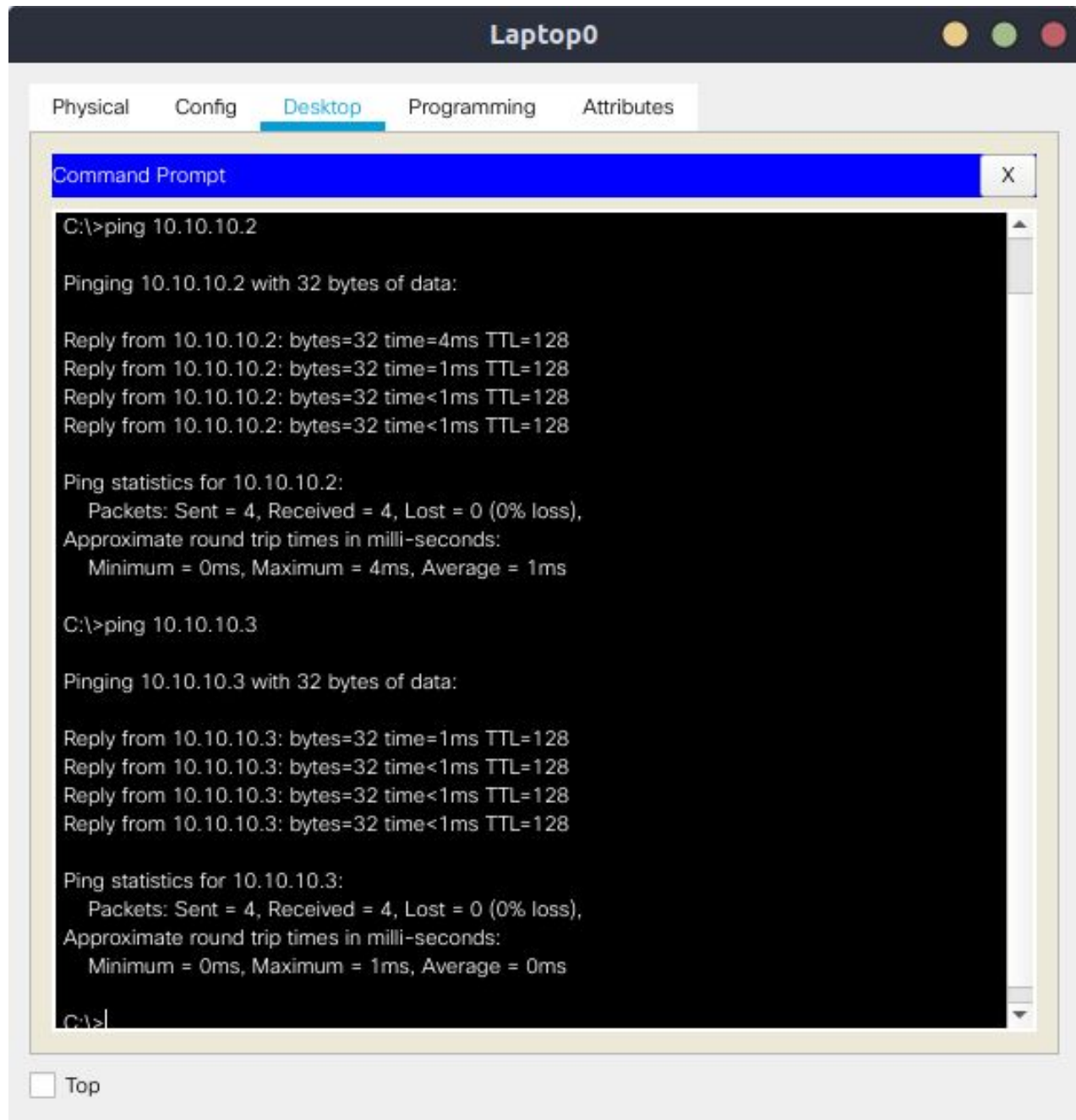


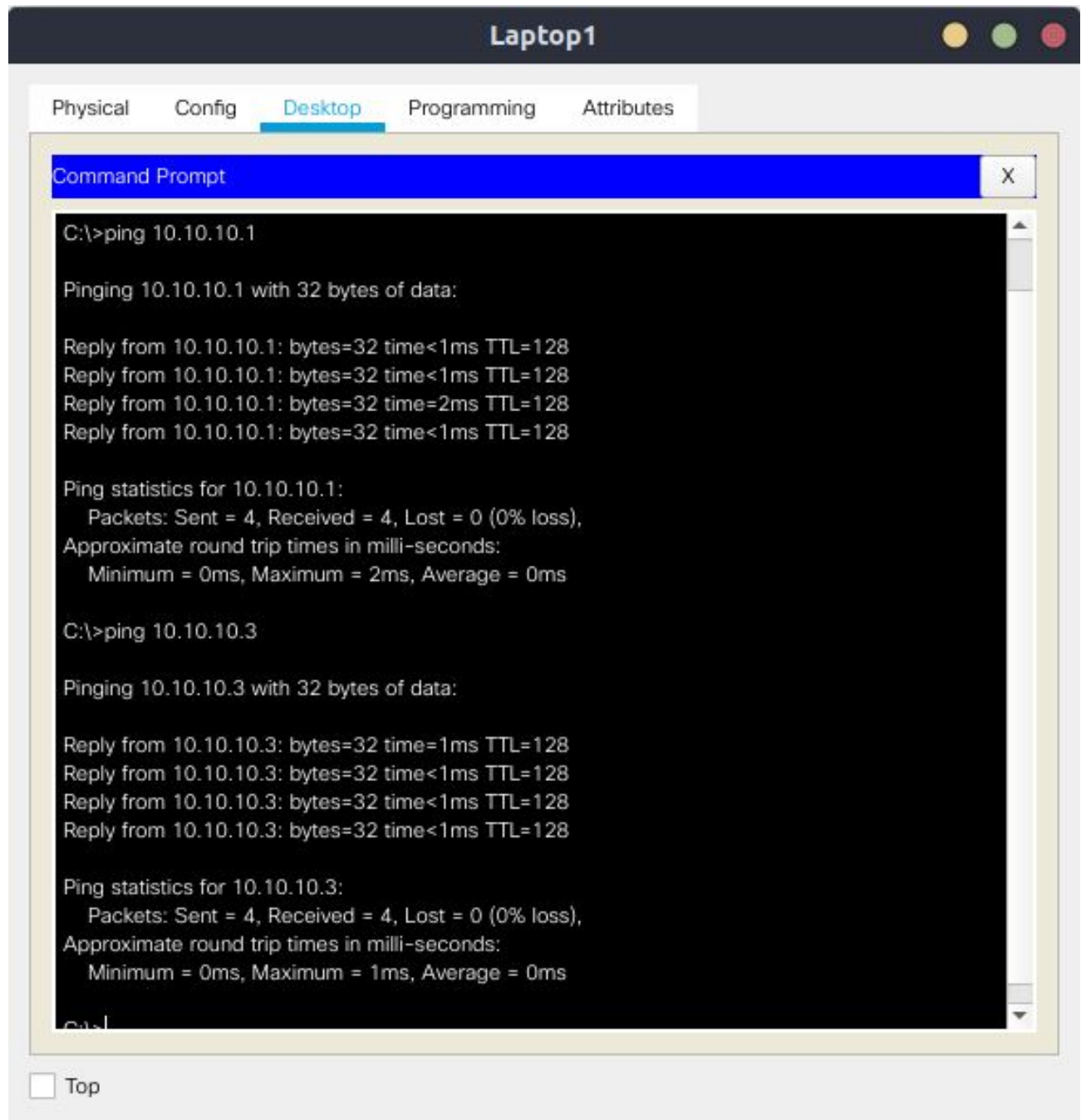


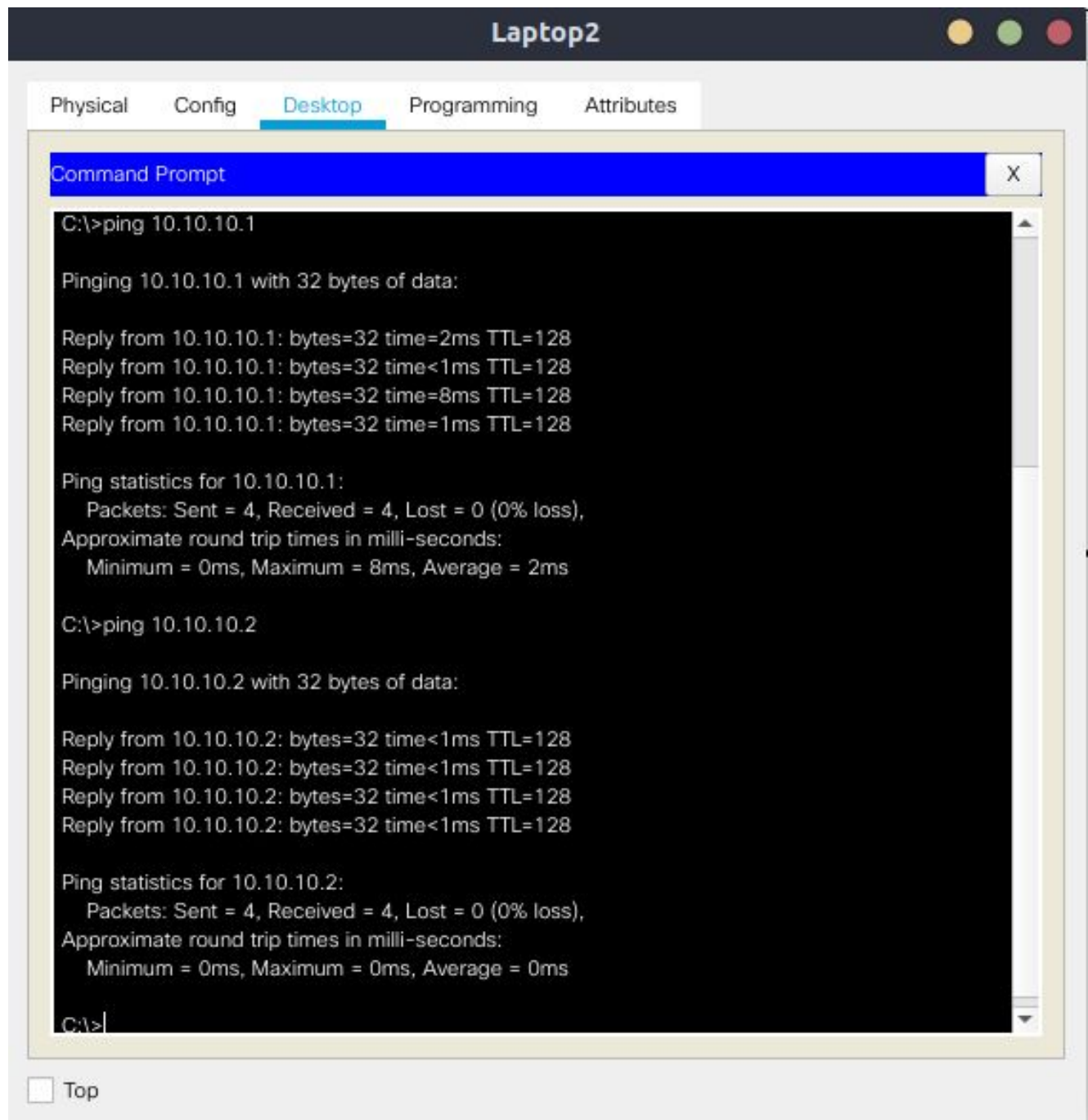
Q2. Create a LAN (named LAN-A) with 3 hosts using a hub. Ping each pair of nodes.

LAN-A was created using a hub and three hosts were connected to it using straight through cable. After activating the connection lines, the following results were obtained.



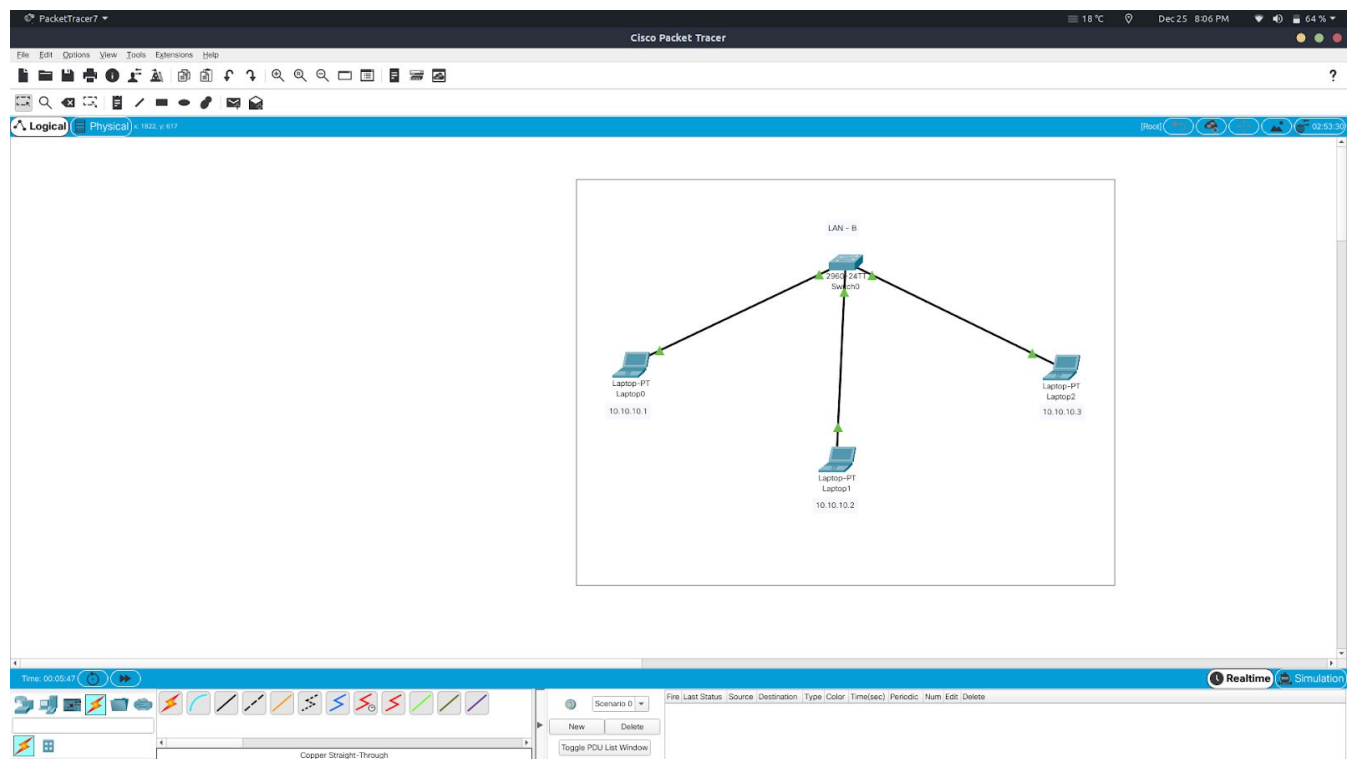




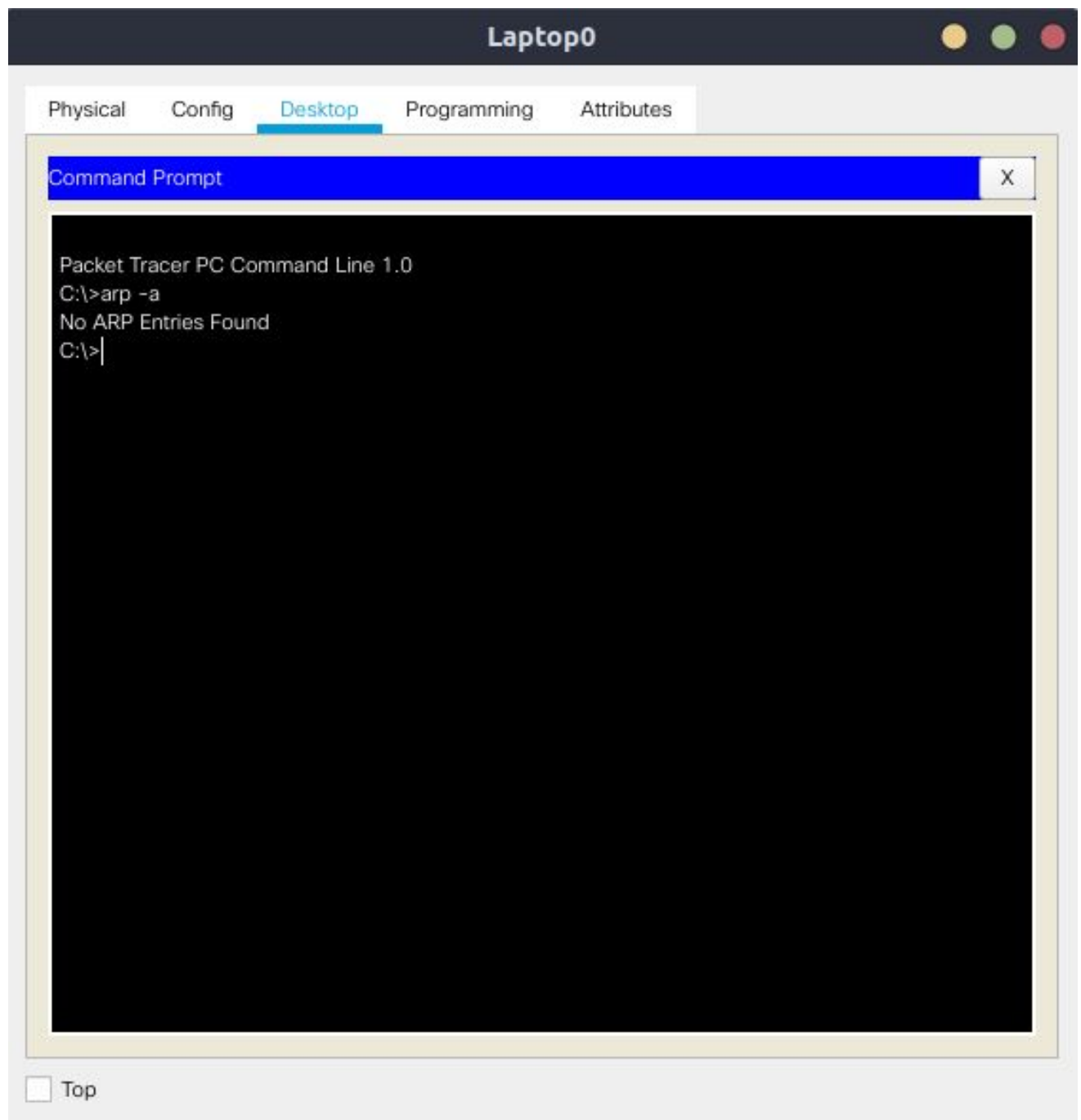


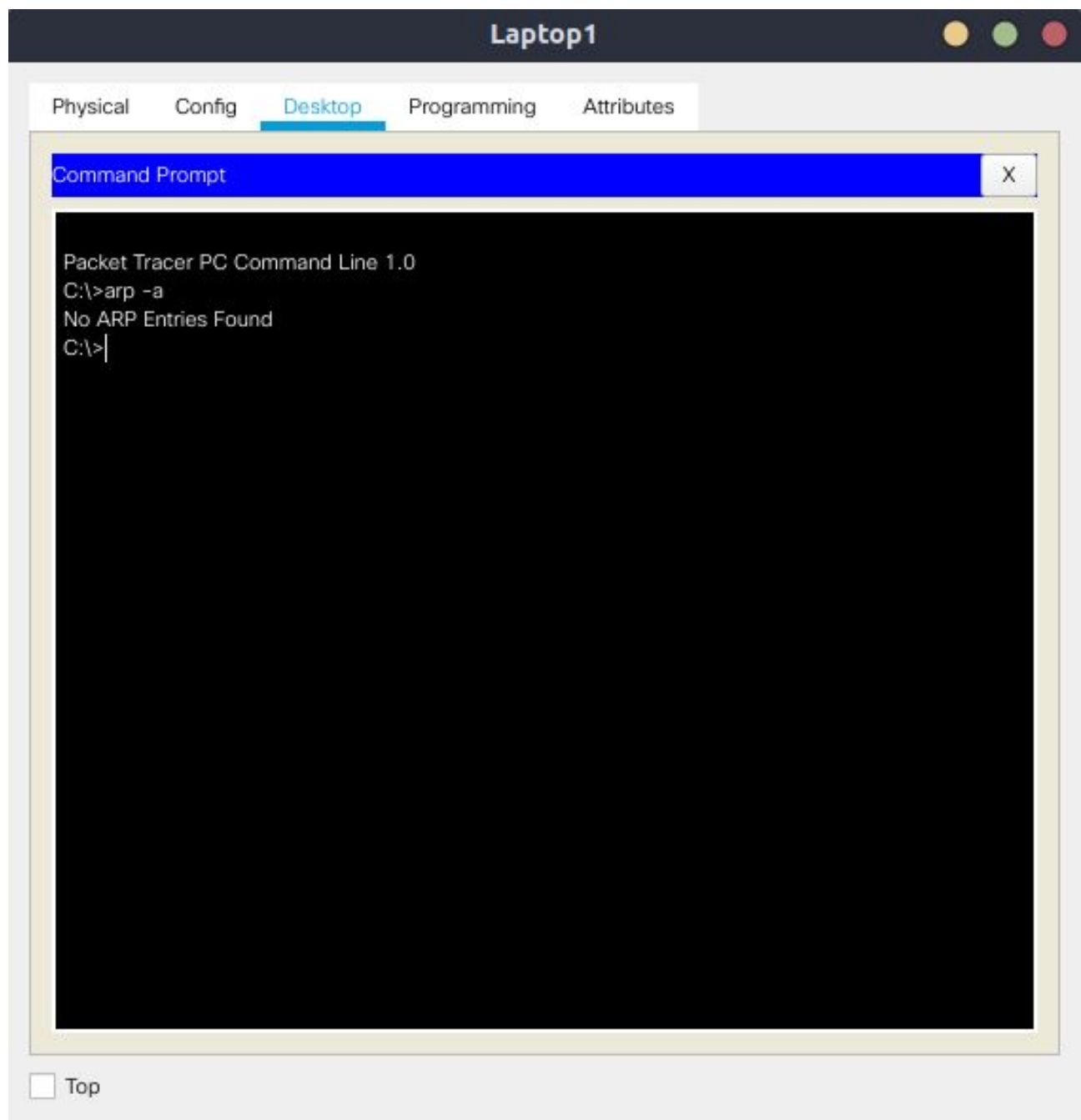
Q3. Create a LAN (named LAN-B) with 3 hosts using a switch. Record contents of the ARP Table of end hosts and the MAC Forwarding Table of the switch. Ping each pair of nodes. Now record the contents of the ARP Table of end hosts and the MAC Forwarding Table of the switch again.

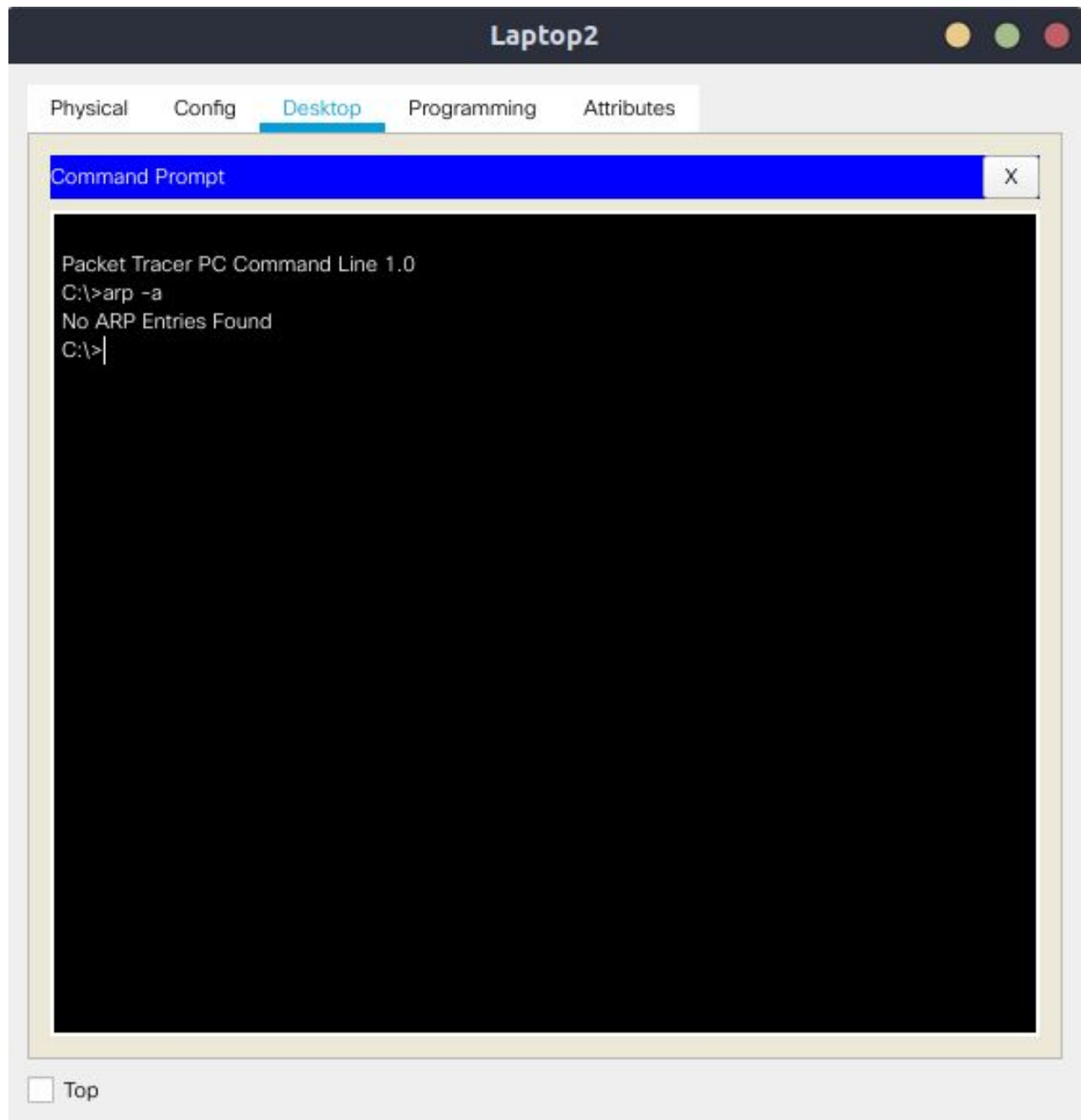
LAN-B was created using a switch (Cisco 2960) and three hosts were connected to it. After activating the connections, the following results were obtained.



Initially, before doing any ping:







Switch0

Physical

Config

CLI

Attributes

IOS Command Line Interface

Press RETURN to get started!

%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

Switch>

Switch>EN

Switch#show mac-address-table

Mac Address Table

Vlan	Mac Address	Type	Ports
----	-----	-----	-----

Switch#

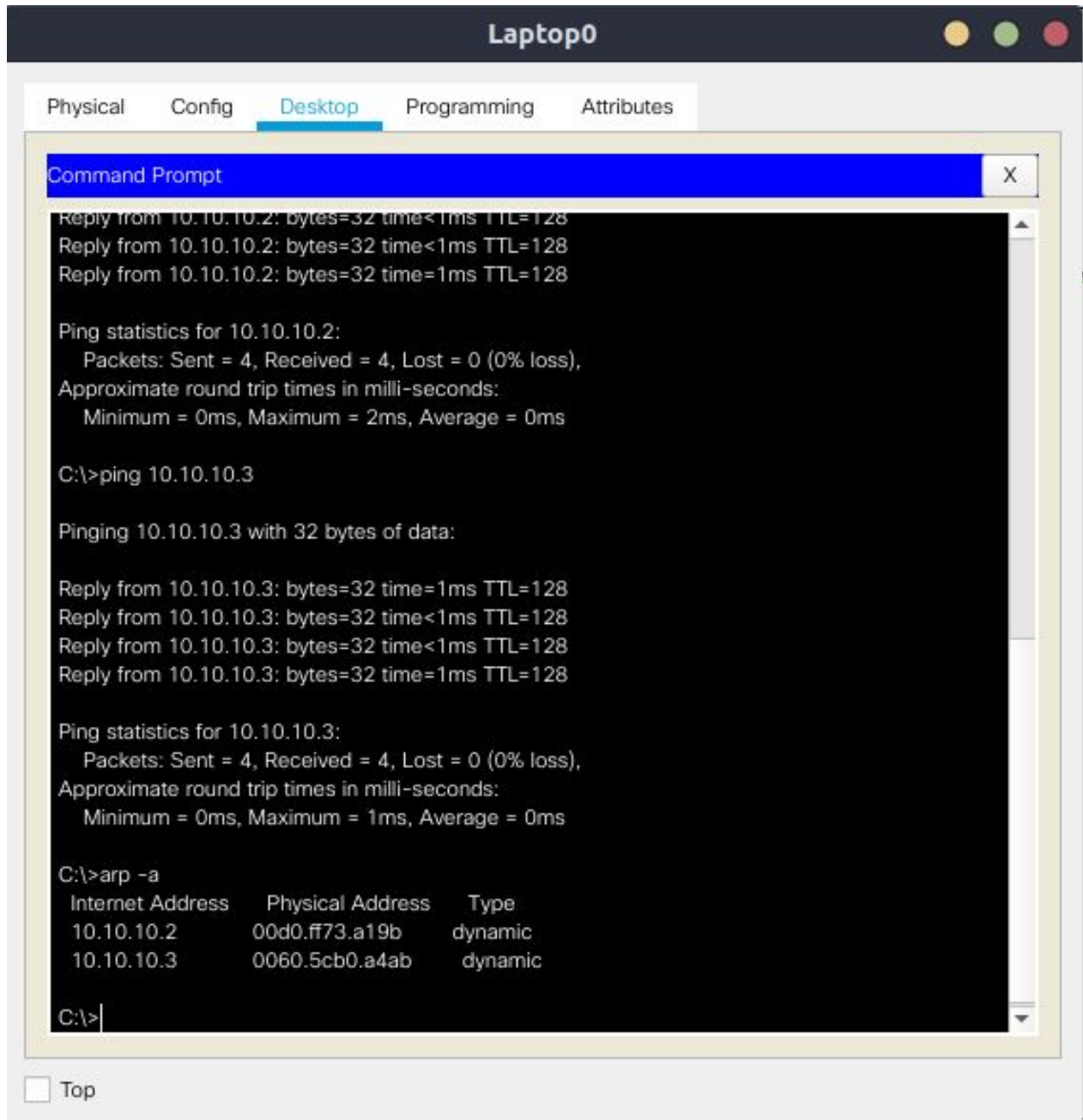
Ctrl+F6 to exit CLI focus

Copy

Paste

☐ Top

After pinging each possible pair of nodes, the following were obtained:



The screenshot shows a laptop window titled "Laptop0" with tabs for Physical, Config, Desktop, Programming, and Attributes. The Desktop tab is active, displaying a Command Prompt window. The Command Prompt shows the results of pinging 10.10.10.2 and 10.10.10.3, and the output of the arp -a command.

```
Command Prompt
Reply from 10.10.10.2: bytes=32 time<1ms TTL=128
Reply from 10.10.10.2: bytes=32 time<1ms TTL=128
Reply from 10.10.10.2: bytes=32 time=1ms TTL=128

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>ping 10.10.10.3

Pinging 10.10.10.3 with 32 bytes of data:

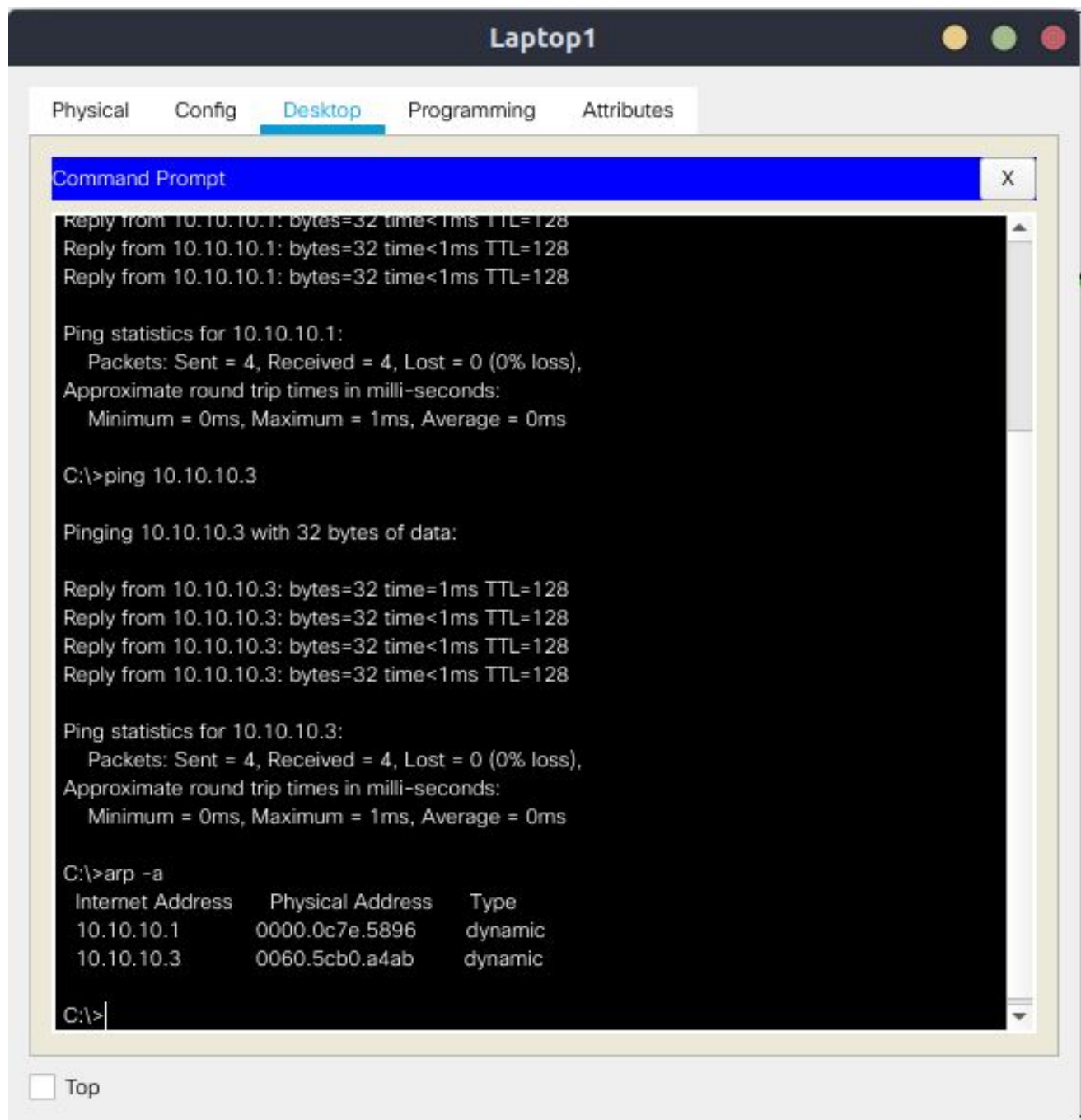
Reply from 10.10.10.3: bytes=32 time=1ms TTL=128
Reply from 10.10.10.3: bytes=32 time<1ms TTL=128
Reply from 10.10.10.3: bytes=32 time<1ms TTL=128
Reply from 10.10.10.3: bytes=32 time=1ms TTL=128

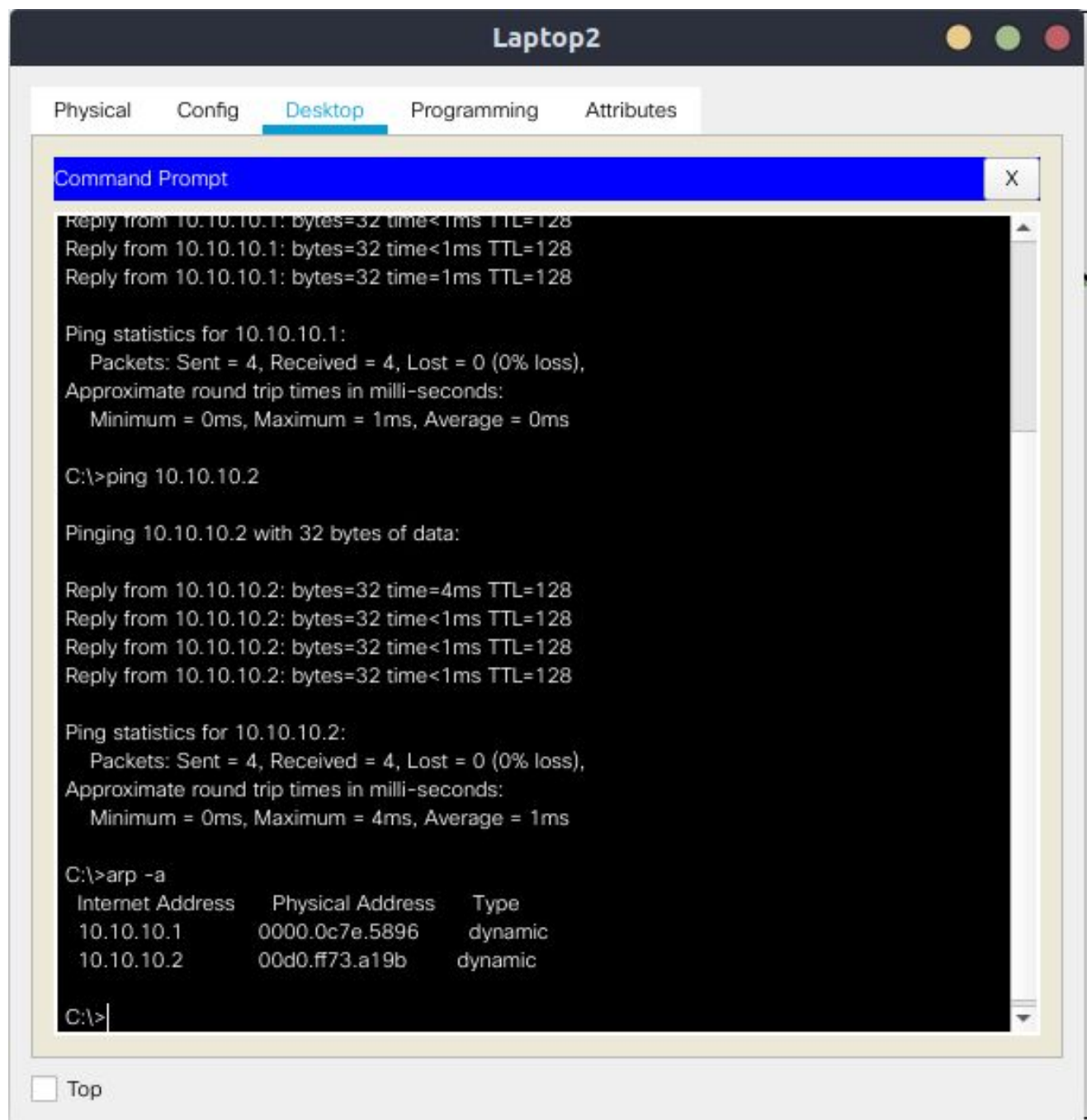
Ping statistics for 10.10.10.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>arp -a
Internet Address      Physical Address      Type
10.10.10.2            00d0.ff73.a19b        dynamic
10.10.10.3            0060.5cb0.a4ab        dynamic

C:\>
```

☐ Top





Switch0

PhysicalConfigCLIAttributes

IOS Command Line Interface

%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up

Switch>

Switch>EN

Switch#show mac-address-table

Mac Address Table

Vlan	Mac Address	Type	Ports
1	0000.0c7e.5896	DYNAMIC	Fa0/1
1	0060.5cb0.a4ab	DYNAMIC	Fa0/3
1	00d0.ff73.a19b	DYNAMIC	Fa0/2

Switch#

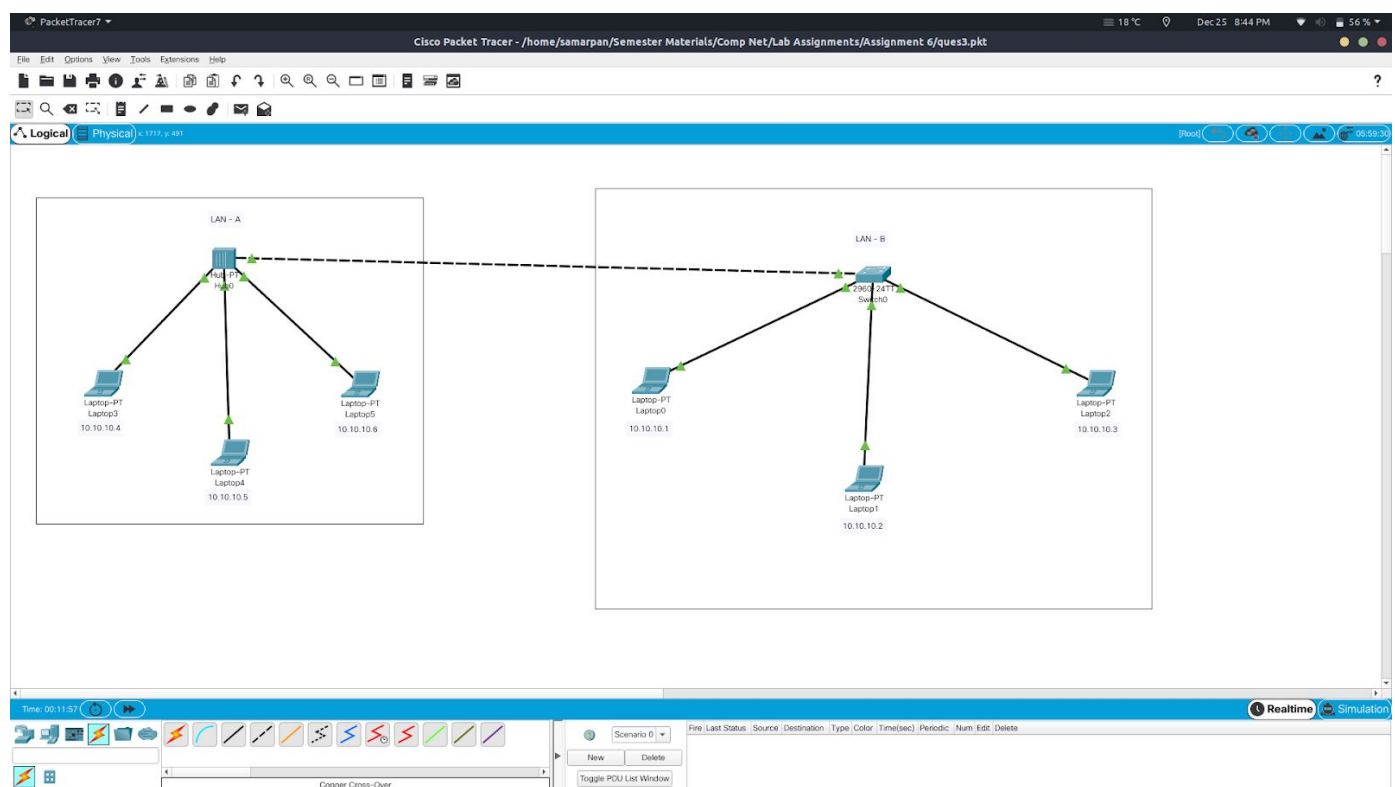
Ctrl+F6 to exit CLI focus

CopyPaste

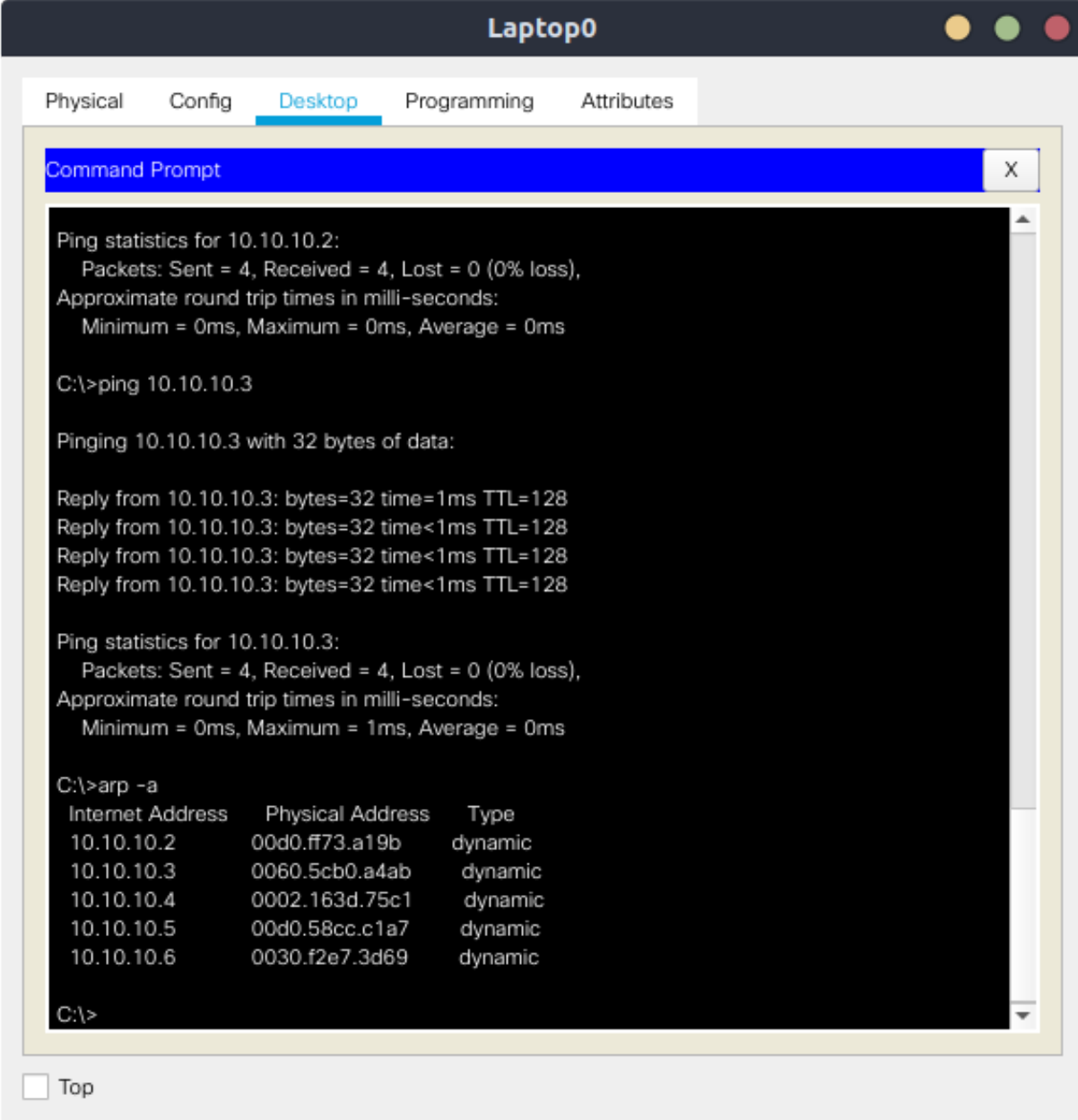
☐ Top

Q4. Connect LAN-A and LAN-B by connecting the hub and switch using a crossover cable. Ping between each pair of hosts of LAN-A and LAN-B. Now record the contents of the ARP Table of end hosts and the MAC Forwarding Table of the switch again.

LAN-A and LAN-B are connected by using a crossover cable. After that, each possible pair of nodes is pinged again. The following results were obtained.



ARP tables of the end hosts of both LAN A and LAN B:

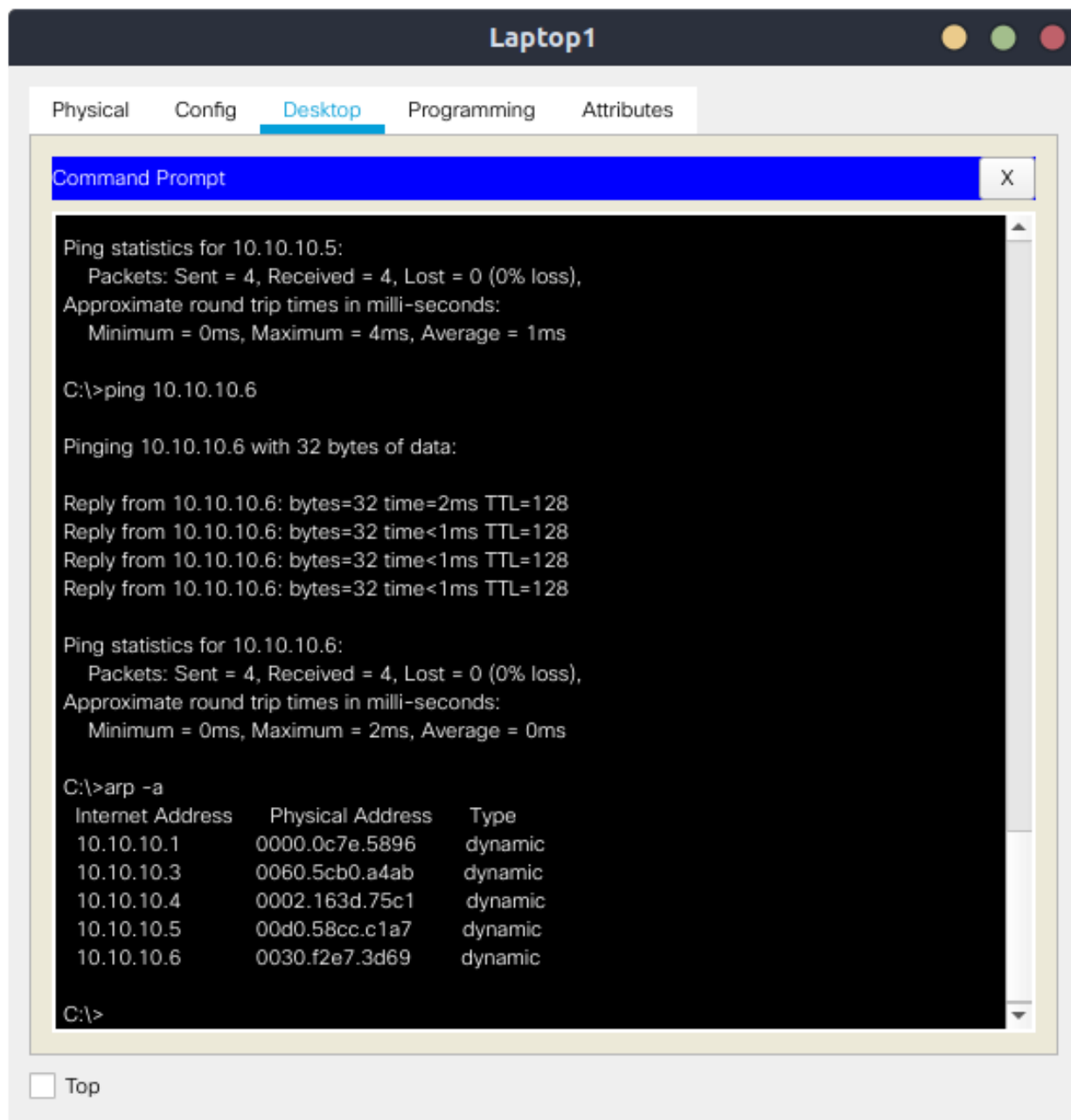


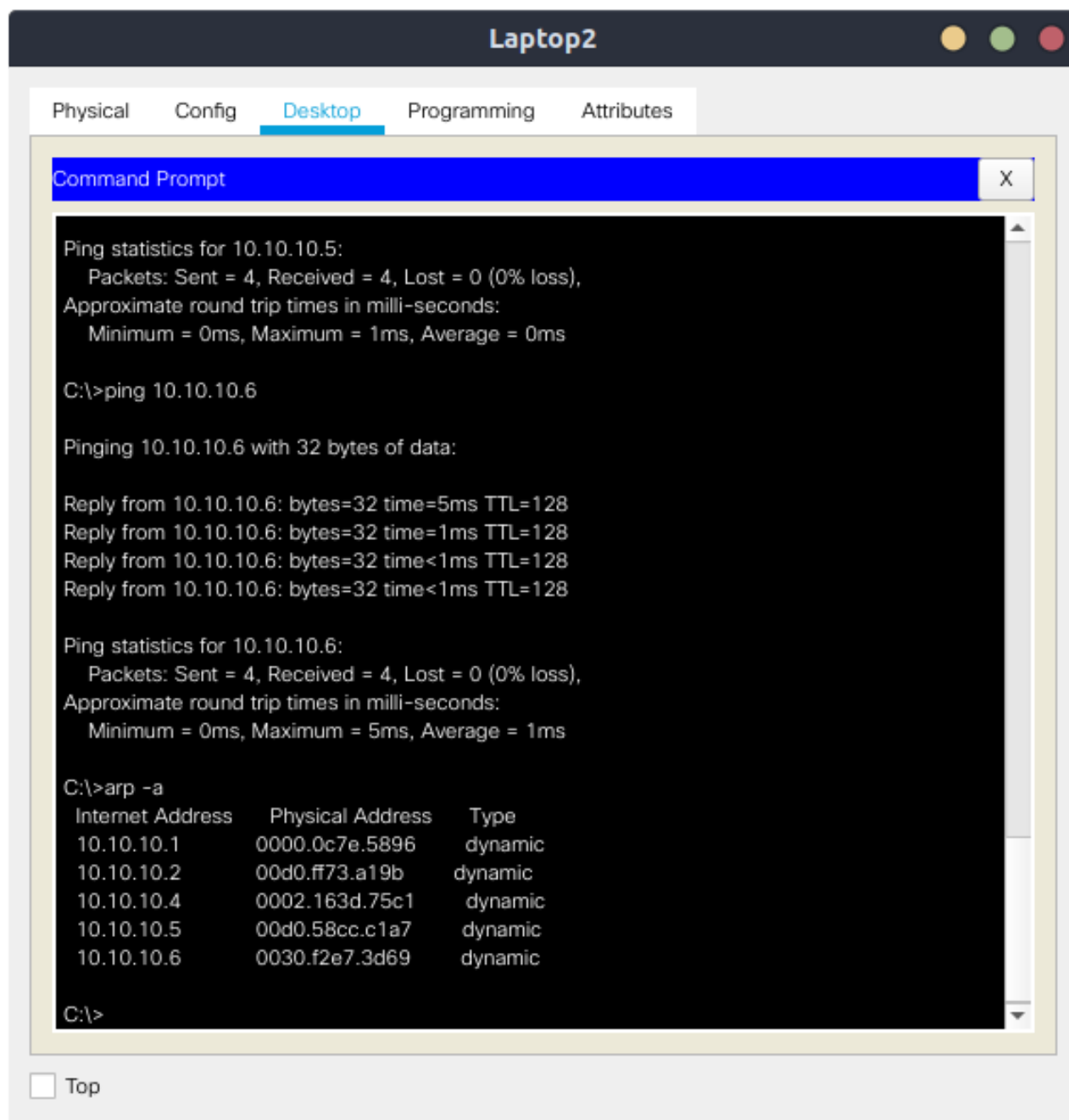
The screenshot shows a laptop window titled "Laptop0" with tabs for Physical, Config, Desktop (selected), Programming, and Attributes. A Command Prompt window is open, displaying the results of several network commands.

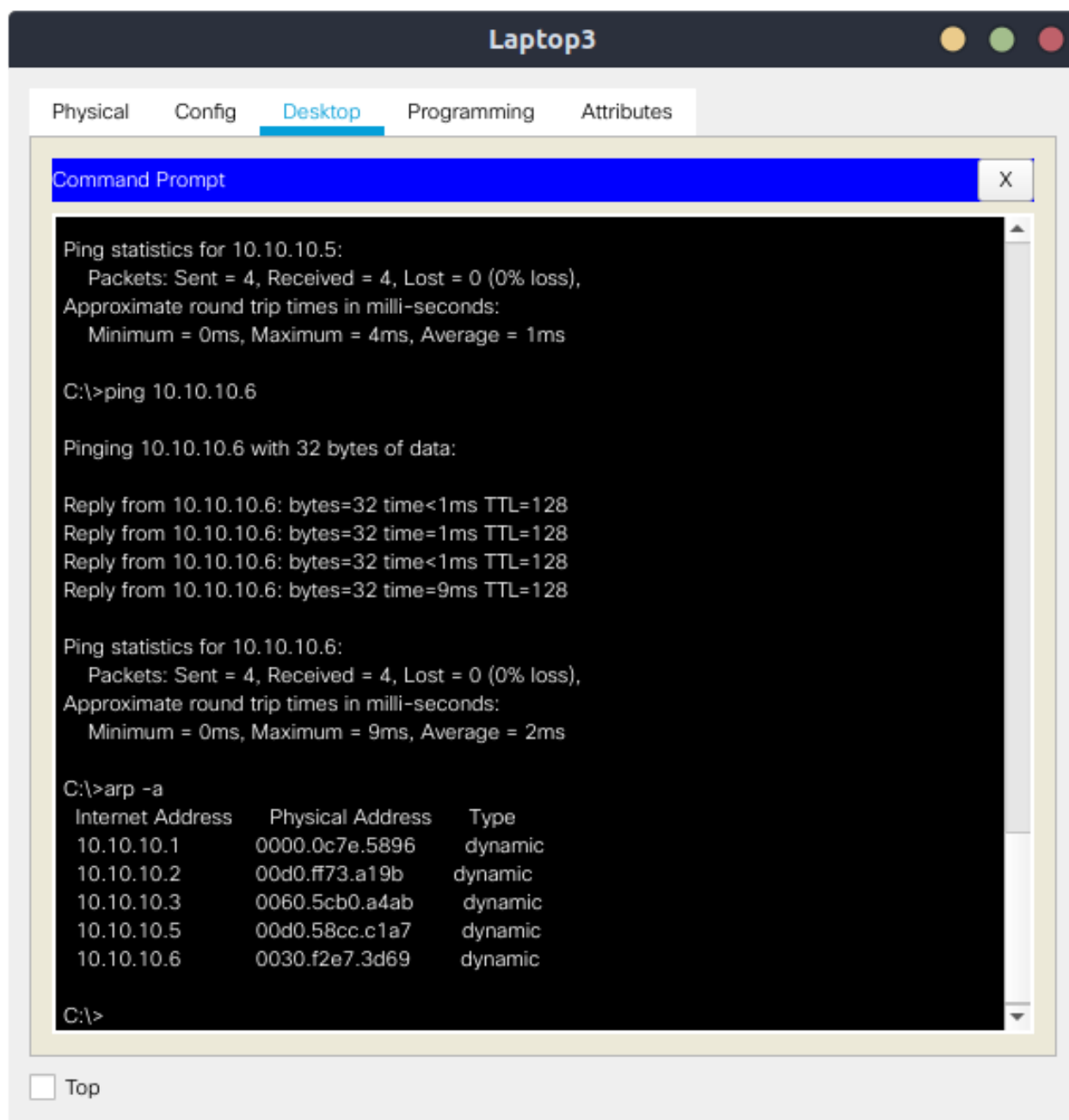
```
Command Prompt
```

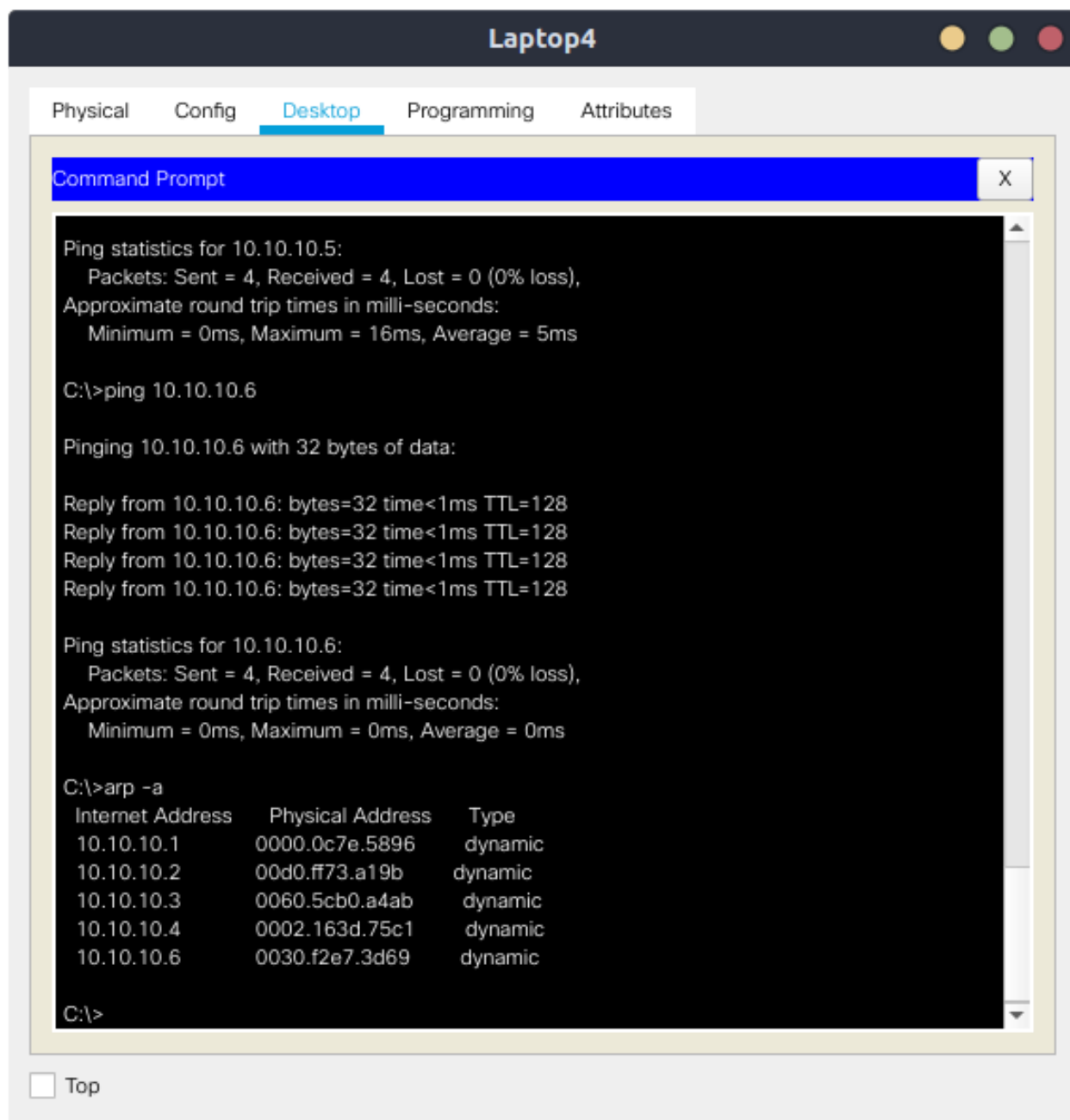
```
Ping statistics for 10.10.10.2:  
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
  Approximate round trip times in milli-seconds:  
    Minimum = 0ms, Maximum = 0ms, Average = 0ms  
  
C:\>ping 10.10.10.3  
  
Pinging 10.10.10.3 with 32 bytes of data:  
  
Reply from 10.10.10.3: bytes=32 time=1ms TTL=128  
Reply from 10.10.10.3: bytes=32 time<1ms TTL=128  
Reply from 10.10.10.3: bytes=32 time<1ms TTL=128  
Reply from 10.10.10.3: bytes=32 time<1ms TTL=128  
  
Ping statistics for 10.10.10.3:  
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
  Approximate round trip times in milli-seconds:  
    Minimum = 0ms, Maximum = 1ms, Average = 0ms  
  
C:\>arp -a  
  
Internet Address      Physical Address      Type  
10.10.10.2            00d0.ff73.a19b        dynamic  
10.10.10.3            0060.5cb0.a4ab        dynamic  
10.10.10.4            0002.163d.75c1        dynamic  
10.10.10.5            00d0.58cc.c1a7        dynamic  
10.10.10.6            0030.f2e7.3d69        dynamic  
  
C:\>
```

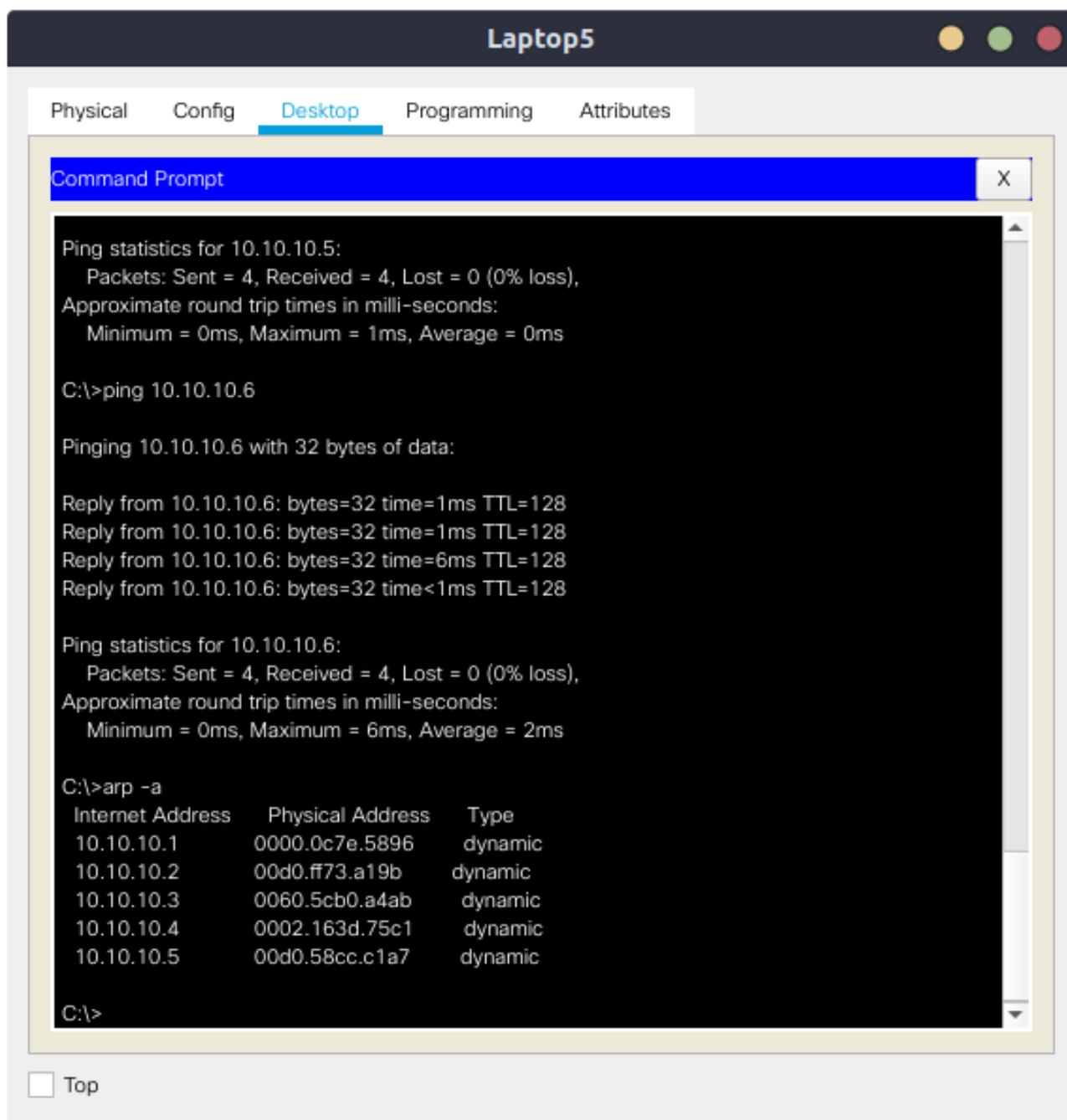
☐ Top



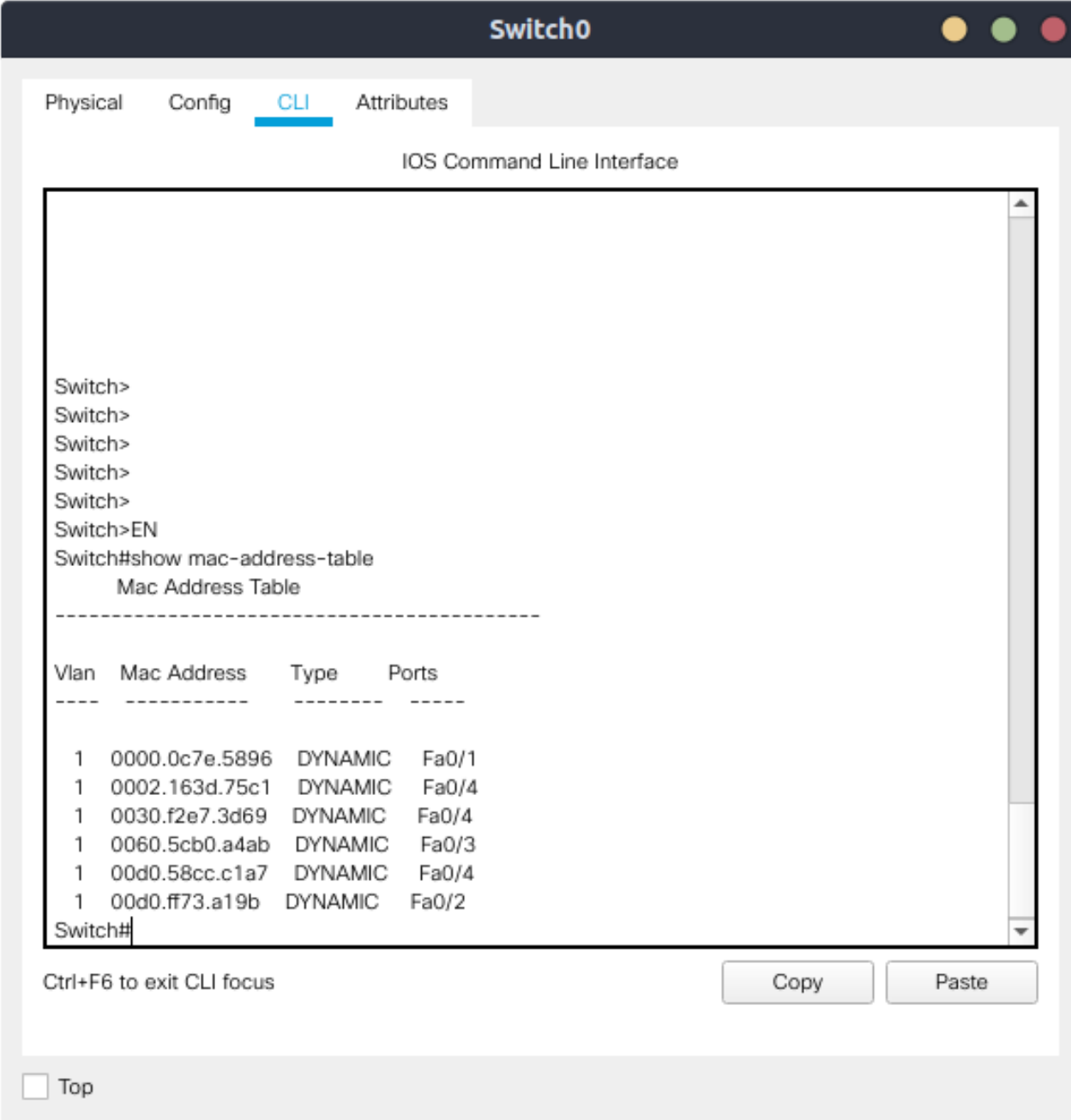








MAC Address table of the switch:



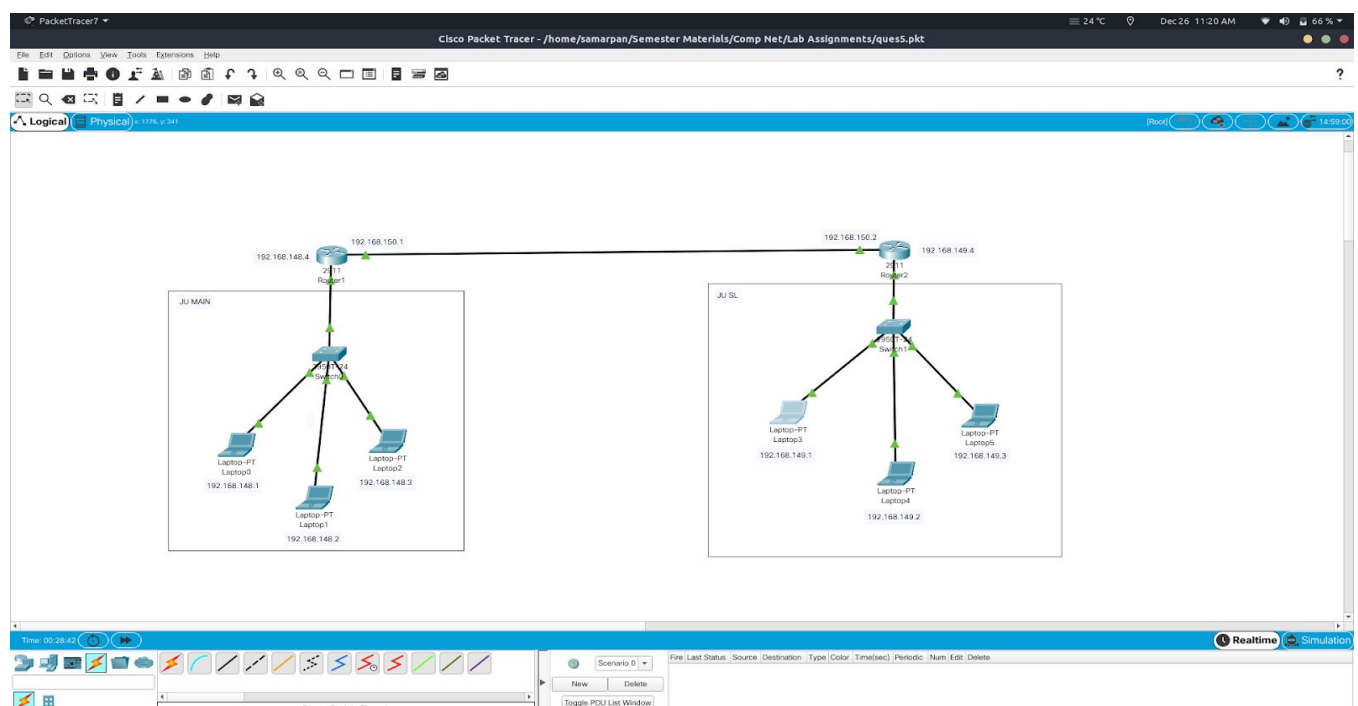
The screenshot shows a web-based interface for a network switch named "Switch0". The interface has four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, displaying the "IOS Command Line Interface". The CLI shows the following commands and output:

```
Switch>
Switch>
Switch>
Switch>
Switch>
Switch>EN
Switch#show mac-address-table
      Mac Address Table
-----
Vlan  Mac Address      Type    Ports
----  -
1     0000.0c7e.5896    DYNAMIC Fa0/1
1     0002.163d.75c1    DYNAMIC Fa0/4
1     0030.f2e7.3d69    DYNAMIC Fa0/4
1     0060.5cb0.a4ab    DYNAMIC Fa0/3
1     00d0.58cc.c1a7    DYNAMIC Fa0/4
1     00d0.ff73.a19b    DYNAMIC Fa0/2
Switch#
```

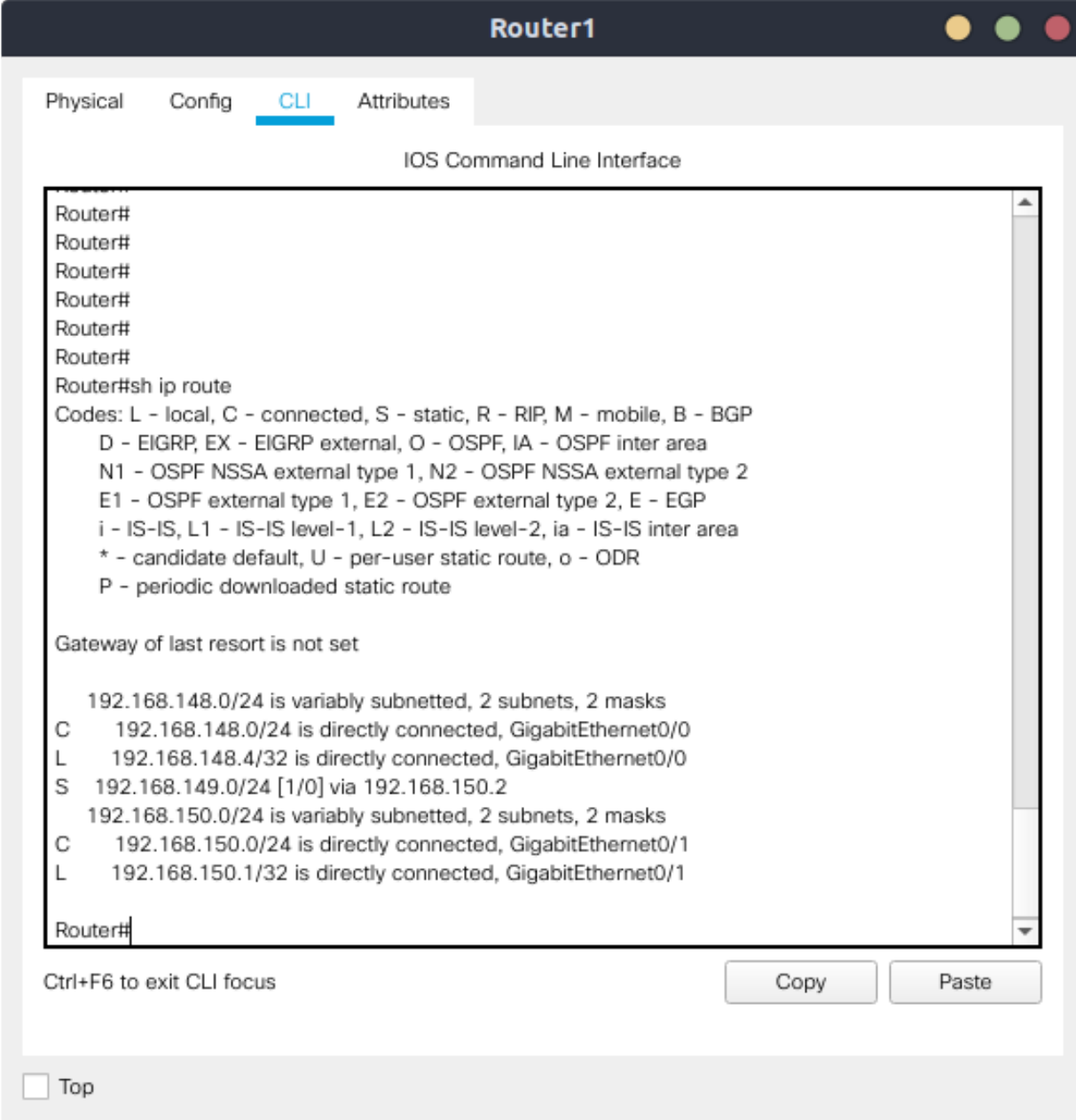
Below the CLI output, there is a status bar with the text "Ctrl+F6 to exit CLI focus" and two buttons: "Copy" and "Paste". At the bottom left, there is a checkbox labeled "Top".

Q5. Create a LAN (named JU-Main) with three hosts connected via a layer-2 switch (Cisco 2950 switch PC-LAB1-Switch). Connect the switch to a router (Cisco 1818). Assign IP addresses to all the hosts and the router interface connected to this LAN from network 192.168.148.0/24. Configure default gateway of each host as the IP address of the interface of the router which is connected to the LAN. Create another LAN (named JU-SL) with three hosts connected via a layer-2 switch (Cisco 2950 switch PC-LAB2-Switch). Connect this switch to another router (Cisco 1818). Assign IP addresses to all the hosts and the router interface connected to this LAN from network 192.168.149.0/24. Configure default gateway of each host as the IP address of the interface of the router which is connected to the LAN. Connect the two routers through appropriate WAN interfaces. Assign IP addresses to the WAN interfaces from network 192.168.150.0/24. Add static route in both of the routers to route packets between two LANs.

Two separate LANs were created using a switch and three hosts per LAN. Now, both the LANs are connected to one router each. The routers are further connected using a straight through cable. The IP addresses were set according to the given question. Now, a static route is added between the two routers for communication. After that, ping requests were successfully made between the two different LANs.



IP Route of router 1 (JU MAIN) :



The screenshot shows a web-based interface for a router named "Router1". The interface has a dark blue header with the router name and three colored window control buttons (yellow, green, red). Below the header is a navigation bar with four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected and highlighted with a blue underline. The main content area is titled "IOS Command Line Interface" and contains a text box with the following text:

```
Router#
Router#
Router#
Router#
Router#
Router#
Router#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

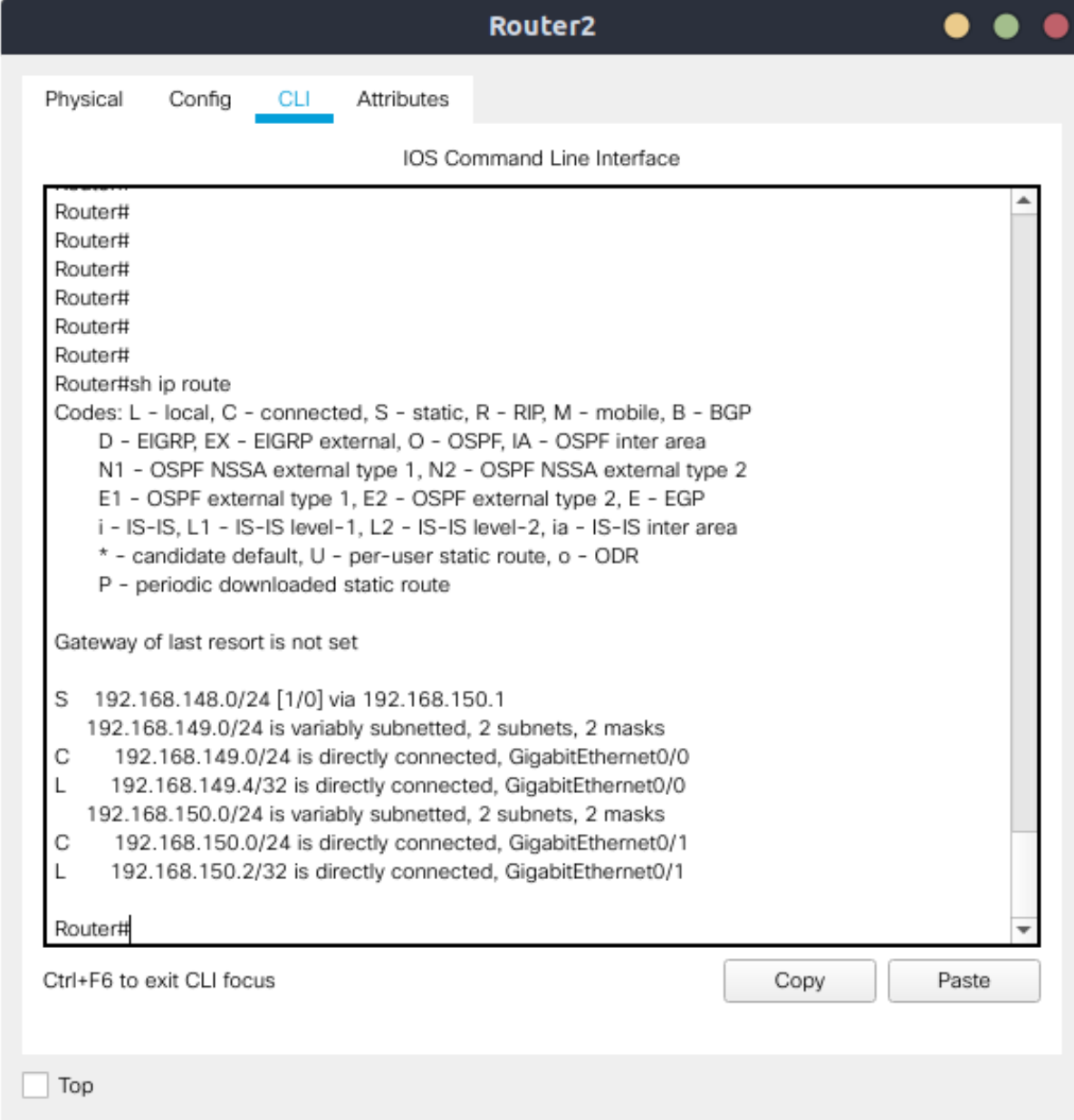
Gateway of last resort is not set

  192.168.148.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.148.0/24 is directly connected, GigabitEthernet0/0
L    192.168.148.4/32 is directly connected, GigabitEthernet0/0
S    192.168.149.0/24 [1/0] via 192.168.150.2
  192.168.150.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.150.0/24 is directly connected, GigabitEthernet0/1
L    192.168.150.1/32 is directly connected, GigabitEthernet0/1

Router#
```

Below the text box, there is a status bar with the text "Ctrl+F6 to exit CLI focus" on the left and two buttons, "Copy" and "Paste", on the right. At the bottom left of the interface, there is a checkbox labeled "Top".

IP Route of router 2 (JU SL) :



The screenshot shows a web-based interface for a router named "Router2". The "CLI" tab is selected, displaying the "IOS Command Line Interface". The command "Router#sh ip route" has been entered, and the output is shown below. The output lists several routes, including static and connected routes, with their respective codes and descriptions. A "Copy" button and a "Paste" button are visible at the bottom right of the CLI window. A "Top" link is also present at the bottom left of the interface.

```
Router#
Router#
Router#
Router#
Router#
Router#
Router#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

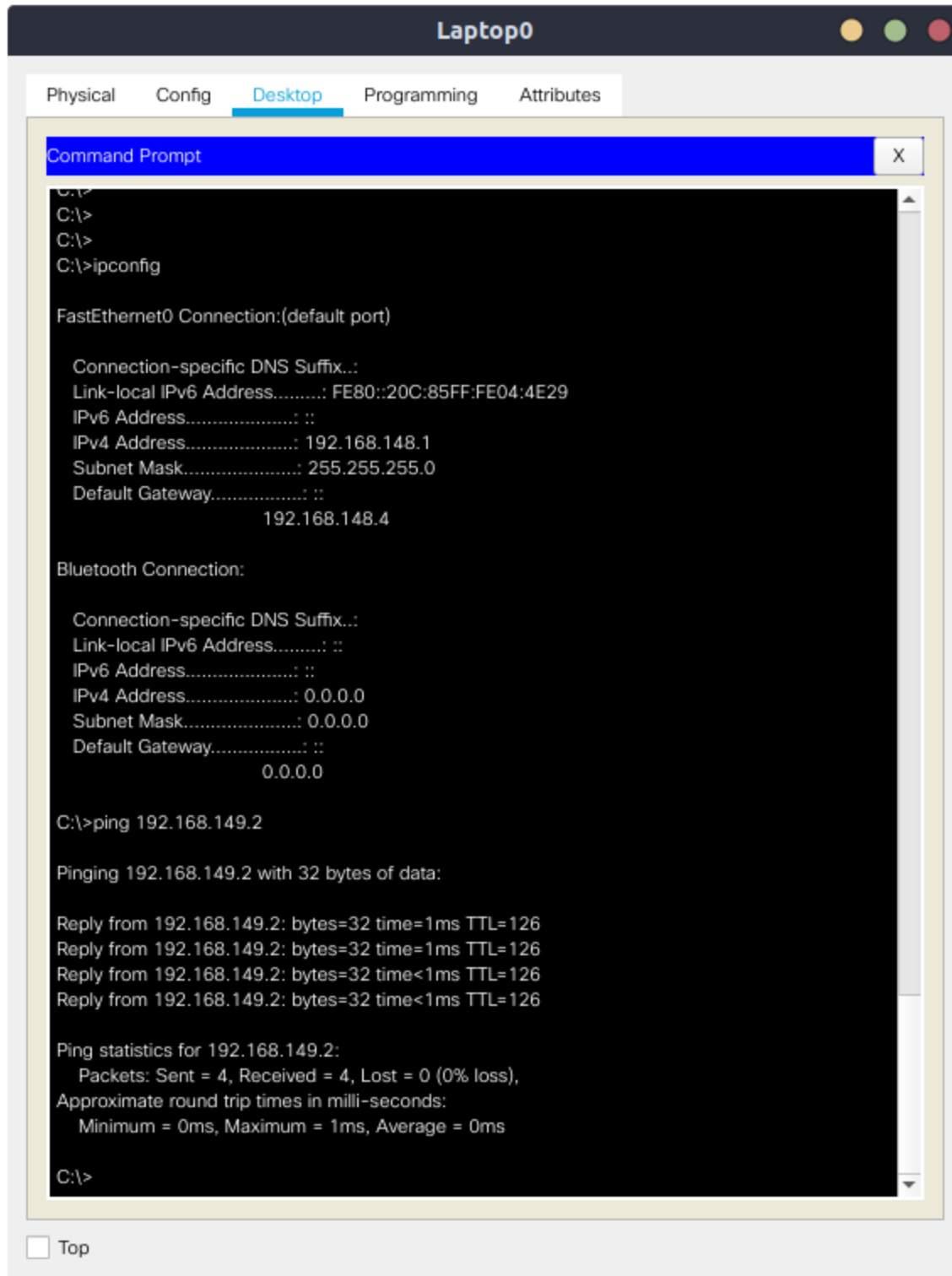
S 192.168.148.0/24 [1/0] via 192.168.150.1
  192.168.149.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.149.0/24 is directly connected, GigabitEthernet0/0
L 192.168.149.4/32 is directly connected, GigabitEthernet0/0
  192.168.150.0/24 is variably subnetted, 2 subnets, 2 masks
C 192.168.150.0/24 is directly connected, GigabitEthernet0/1
L 192.168.150.2/32 is directly connected, GigabitEthernet0/1

Router#
```

Ctrl+F6 to exit CLI focus

☐ Top

Samples of PING executed between the two LANs:



```
Laptop0
Physical Config Desktop Programming Attributes
Command Prompt
C:\>
C:\>
C:\>ipconfig

FastEthernet0 Connection:(default port)

Connection-specific DNS Suffix.:
Link-local IPv6 Address.....: FE80::20C:85FF:FE04:4E29
IPv6 Address.....: ::
IPv4 Address.....: 192.168.148.1
Subnet Mask.....: 255.255.255.0
Default Gateway.....: ::
                        192.168.148.4

Bluetooth Connection:

Connection-specific DNS Suffix.:
Link-local IPv6 Address.....: ::
IPv6 Address.....: ::
IPv4 Address.....: 0.0.0.0
Subnet Mask.....: 0.0.0.0
Default Gateway.....: ::
                        0.0.0.0

C:\>ping 192.168.149.2

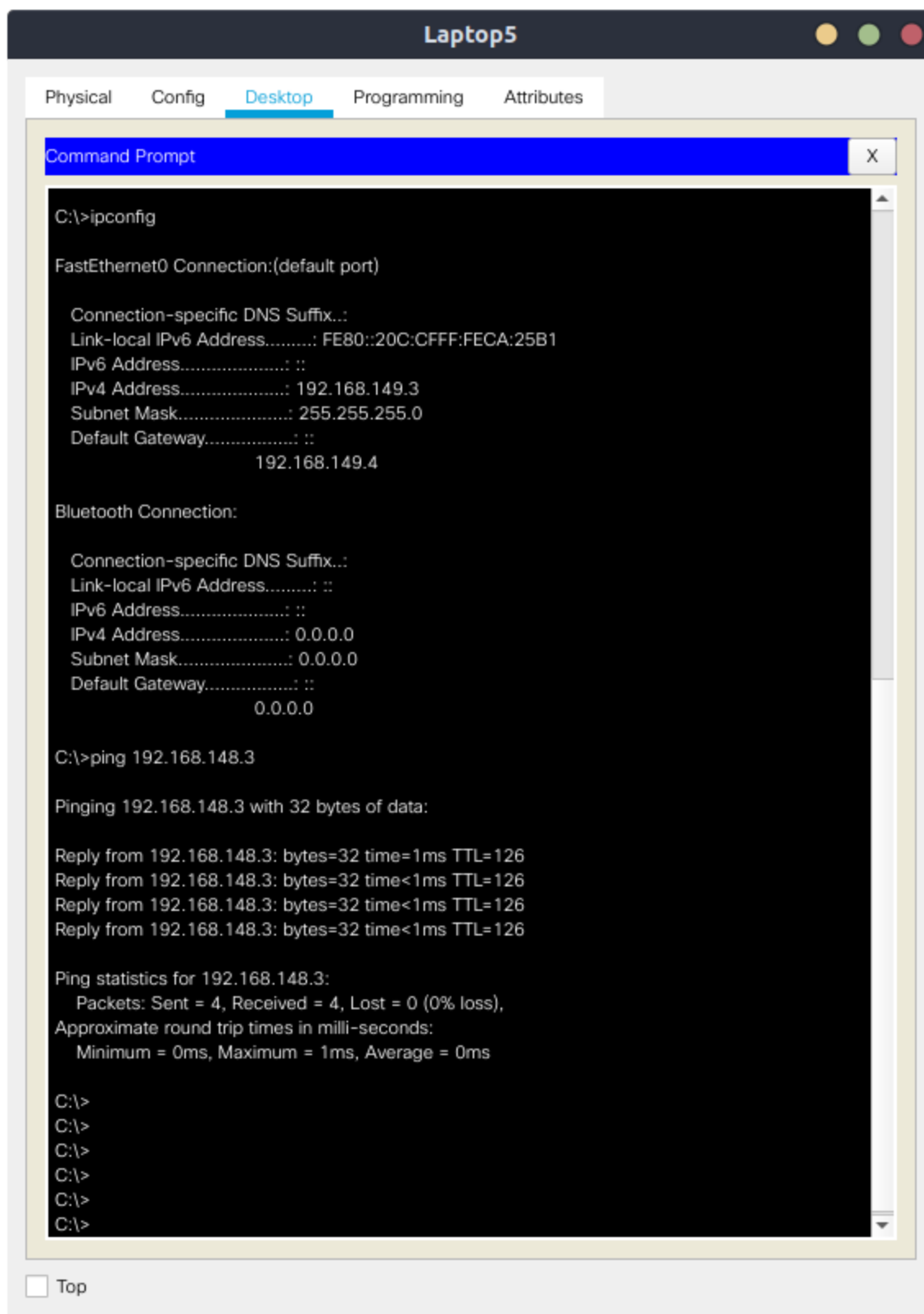
Pinging 192.168.149.2 with 32 bytes of data:

Reply from 192.168.149.2: bytes=32 time=1ms TTL=126
Reply from 192.168.149.2: bytes=32 time=1ms TTL=126
Reply from 192.168.149.2: bytes=32 time<1ms TTL=126
Reply from 192.168.149.2: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.149.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

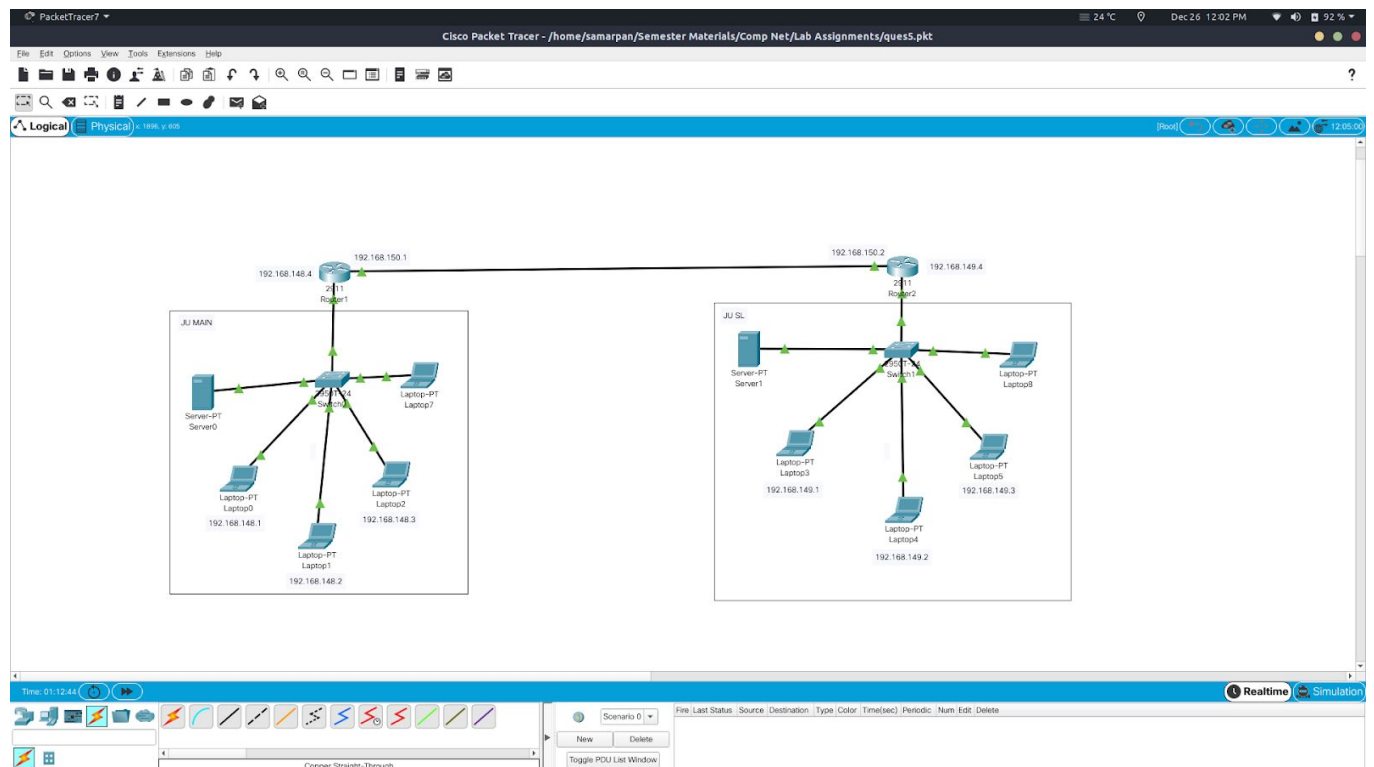
C:\>
```

☐ Top



Q6. Add servers to the individual LANs (in problem 5) and configure them as a DHCP server. Configure the hosts in the individual LAN to obtain IP addresses and addresses of the default gateway via this DHCP server.

In each LAN, a server was added and it was configured as a DHCP server. The default gateway was set to the IP of the router of that particular interface. The IP of the server is set as 192.168.148.5 in JU MAIN and 192.168.149.5 in JU SL. Now, when new hosts are added, IP address and gateway is provided via the DHCP server.



Now, when a new host is added in JU MAIN:

Assigned IP : 192.168.148.7

Gateway: 192.168.148.4

Laptop7

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface: FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address: 192.168.148.7

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.148.4

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::201:C7FF:FE5C:685A

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

☐ Top

Now, a new host is added in JU SL:

Assigned IP : 192.168.149.6

Gateway: 192.168.149.4

Laptop8

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address 192.168.149.6

Subnet Mask 255.255.255.0

Default Gateway 192.168.149.4

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::20D:BDFF:FE8B:EE22

Default Gateway

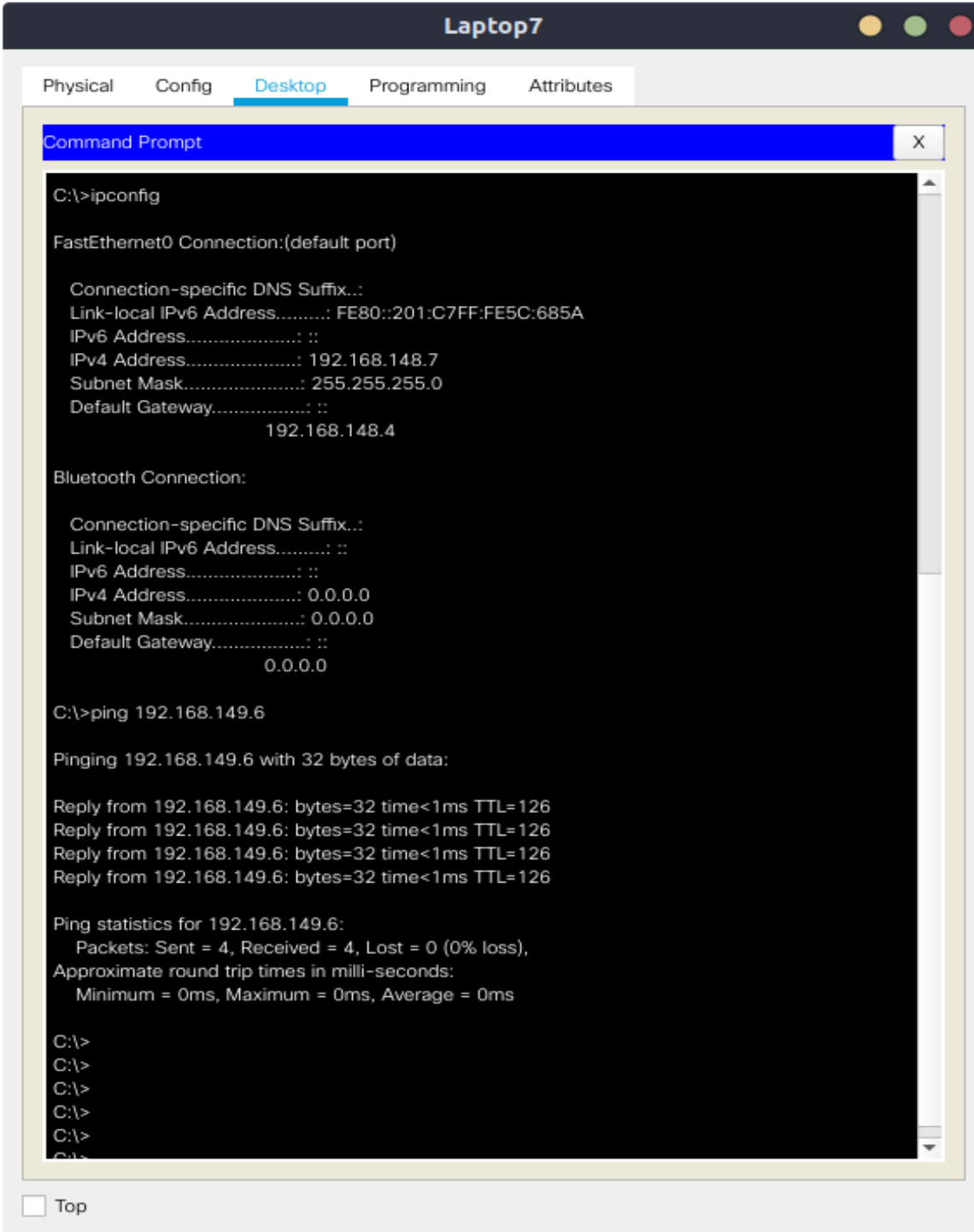
DNS Server

802.1X

☐ Use 802.1X Security

☐ Top

PING command was also successfully executed between the new hosts that were created via the DHCP server:



The screenshot shows a Windows Command Prompt window titled "Laptop7" with tabs for Physical, Config, Desktop, Programming, and Attributes. The Desktop tab is active. The Command Prompt displays the output of the following commands:

```
C:\>ipconfig

FastEthernet0 Connection:(default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address.....: FE80::201:C7FF:FE5C:685A
    IPv6 Address.....: ::
    IPv4 Address.....: 192.168.148.7
    Subnet Mask.....: 255.255.255.0
    Default Gateway.....: ::
                        192.168.148.4

Bluetooth Connection:

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address.....: ::
    IPv6 Address.....: ::
    IPv4 Address.....: 0.0.0.0
    Subnet Mask.....: 0.0.0.0
    Default Gateway.....: ::
                        0.0.0.0

C:\>ping 192.168.149.6

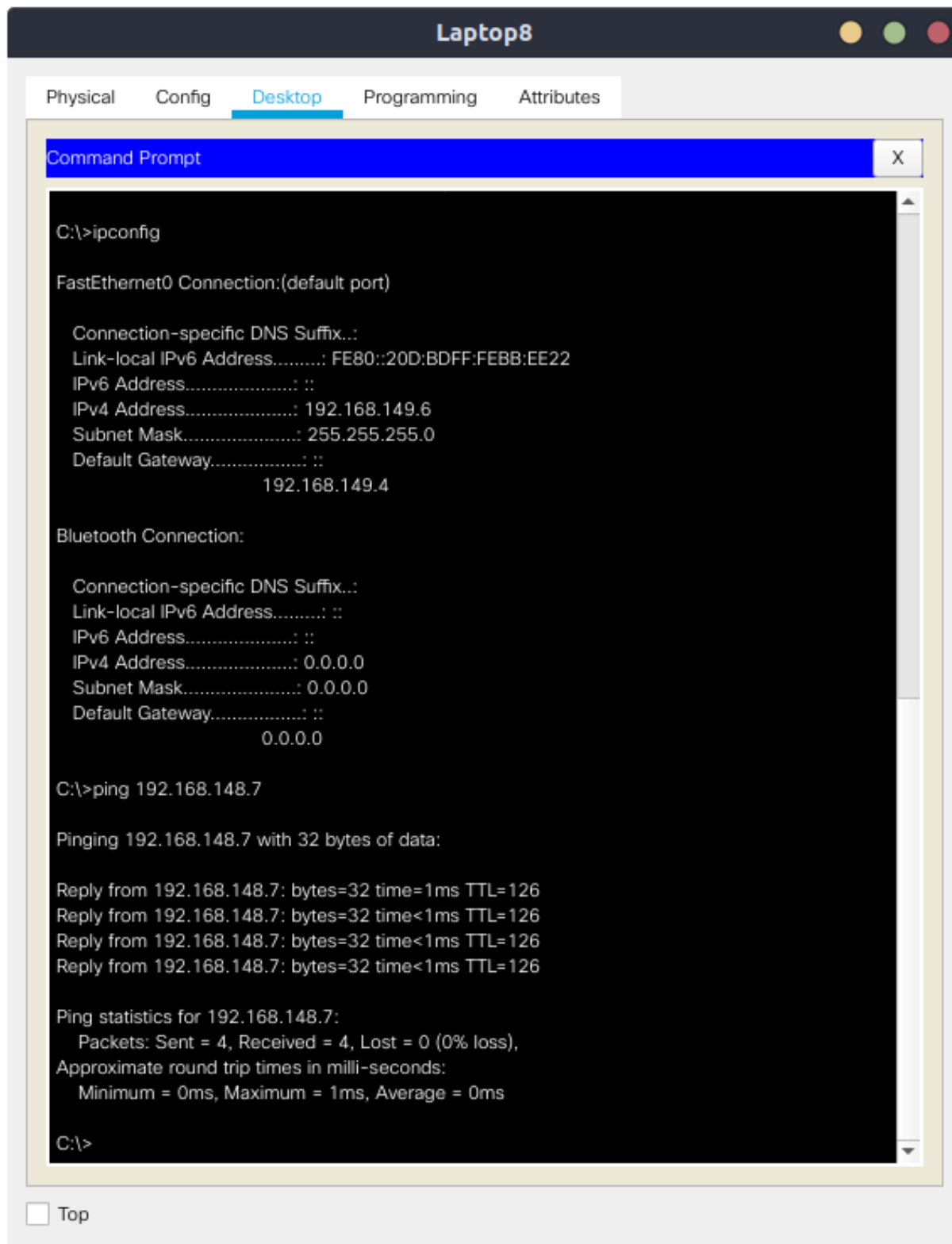
Pinging 192.168.149.6 with 32 bytes of data:

Reply from 192.168.149.6: bytes=32 time<1ms TTL=126
Reply from 192.168.149.6: bytes=32 time<1ms TTL=126
Reply from 192.168.149.6: bytes=32 time<1ms TTL=126
Reply from 192.168.149.6: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.149.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

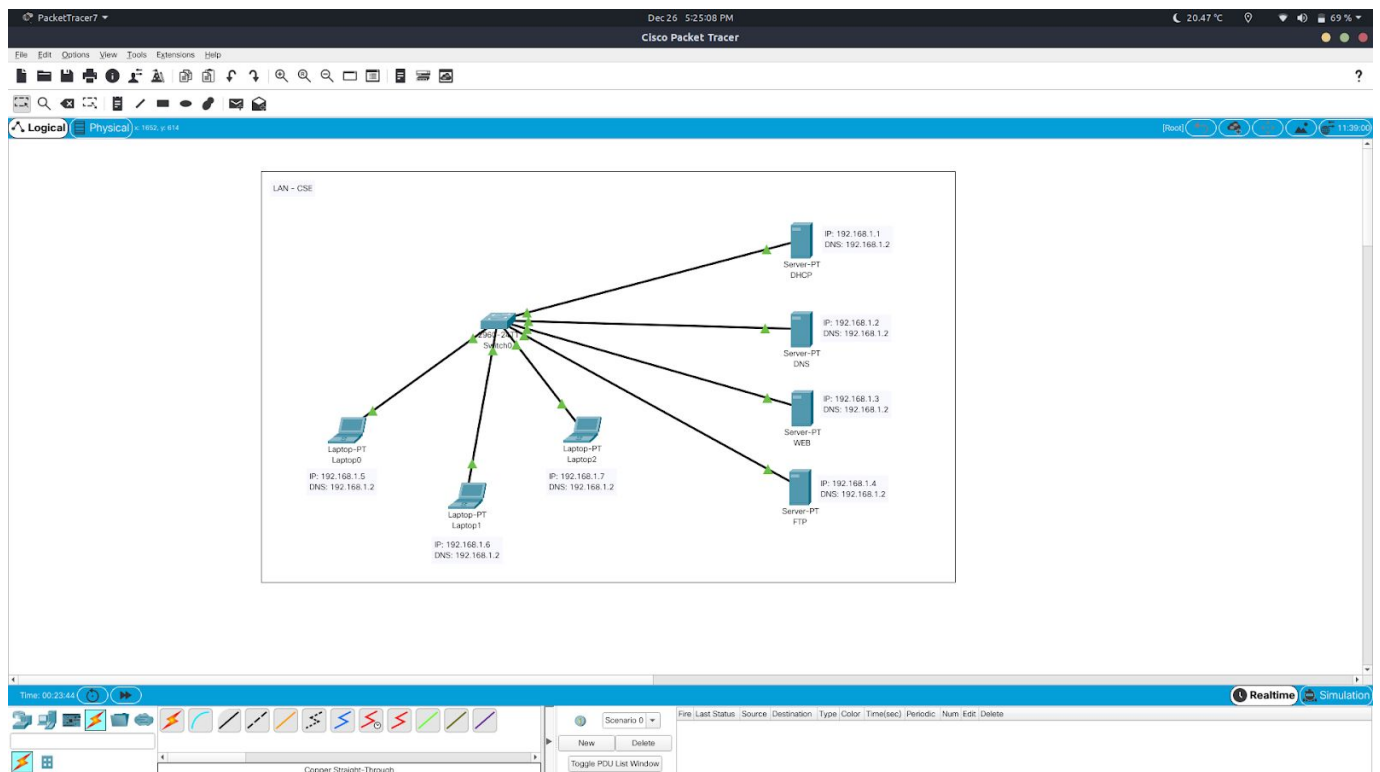
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
```

At the bottom left of the window, there is a checkbox labeled "Top" which is currently unchecked.



Q7. Create a LAN (CSE) with three hosts connected via a layer-2 switch (Cisco 2950 switch CSE-Switch). Also add a web server and a ftp server to this LAN. The hosts dynamically get their IP addresses from a local DHCP server. Servers are assigned fixed IP addresses. Configure the individual hosts to use the local DNS server for name resolution. Add a Domain Name Server (DNS) to this LAN. Create appropriate records in the DNS server for the individual servers in the LAN. The domain name of the LAN is cse.myuniv.edu. Configure the individual hosts to use the local DNS server for name resolution.

A LAN was created using a switch and three hosts. Four servers were also added to the switch as per the given question. One of them is the DHCP server which was configured so that the hosts added to the switch could generate their own IP address using the DHCP server. A WEB and a FTP server were also added. A DNS server was added and configured. Now, the following were obtained.



Dynamic IP address generation for a new host:

The screenshot shows a configuration window titled "Laptop3" with tabs for Physical, Config, Desktop, Programming, and Attributes. The "Desktop" tab is active, displaying the "IP Configuration" section for the "FastEthernet0" interface. The "DHCP" option is selected, and a message indicates "DHCP request successful." The IPv4 configuration fields show an address of 192.168.1.8, subnet mask of 255.255.255.0, default gateway of 0.0.0.0, and DNS server of 192.168.1.2. The IPv6 configuration section shows the "Static" option selected, with fields for IPv6 Address, Link Local Address (FE80::203:E4FF:FE3B:C436), Default Gateway, and DNS Server. The 802.1X section has a checkbox for "Use 802.1X Security" which is unchecked. A "Top" link is at the bottom left.

Laptop3

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface: FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address: 192.168.1.8

Subnet Mask: 255.255.255.0

Default Gateway: 0.0.0.0

DNS Server: 192.168.1.2

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::203:E4FF:FE3B:C436

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

☐ Top

The DNS record table is made as follows:

DNS

PhysicalConfigServicesDesktopProgrammingAttributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

DNS

DNS Service ☒ On ☐ Off

Resource Records

Name Type

A Record

Address

Add

Save

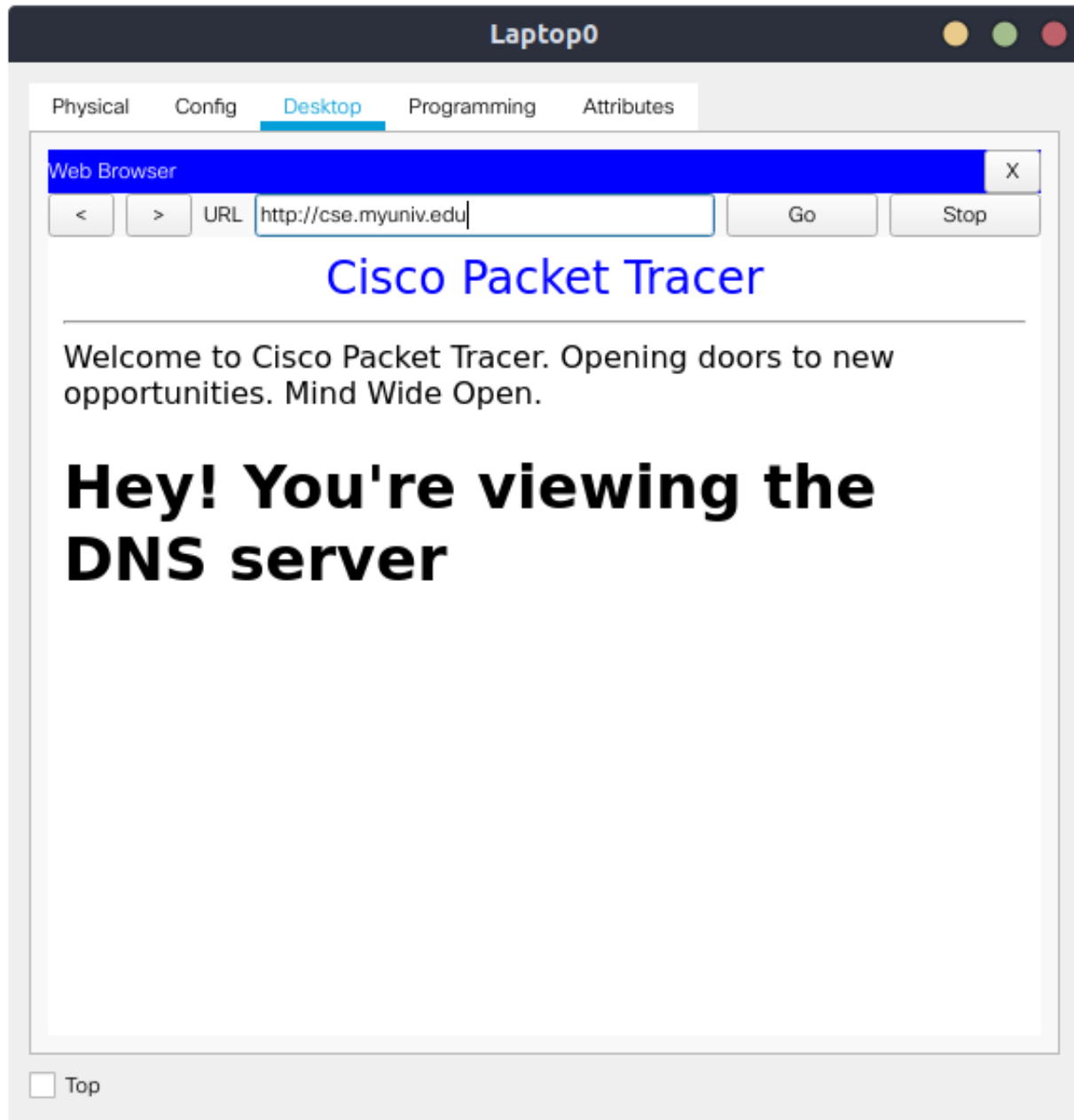
Remove

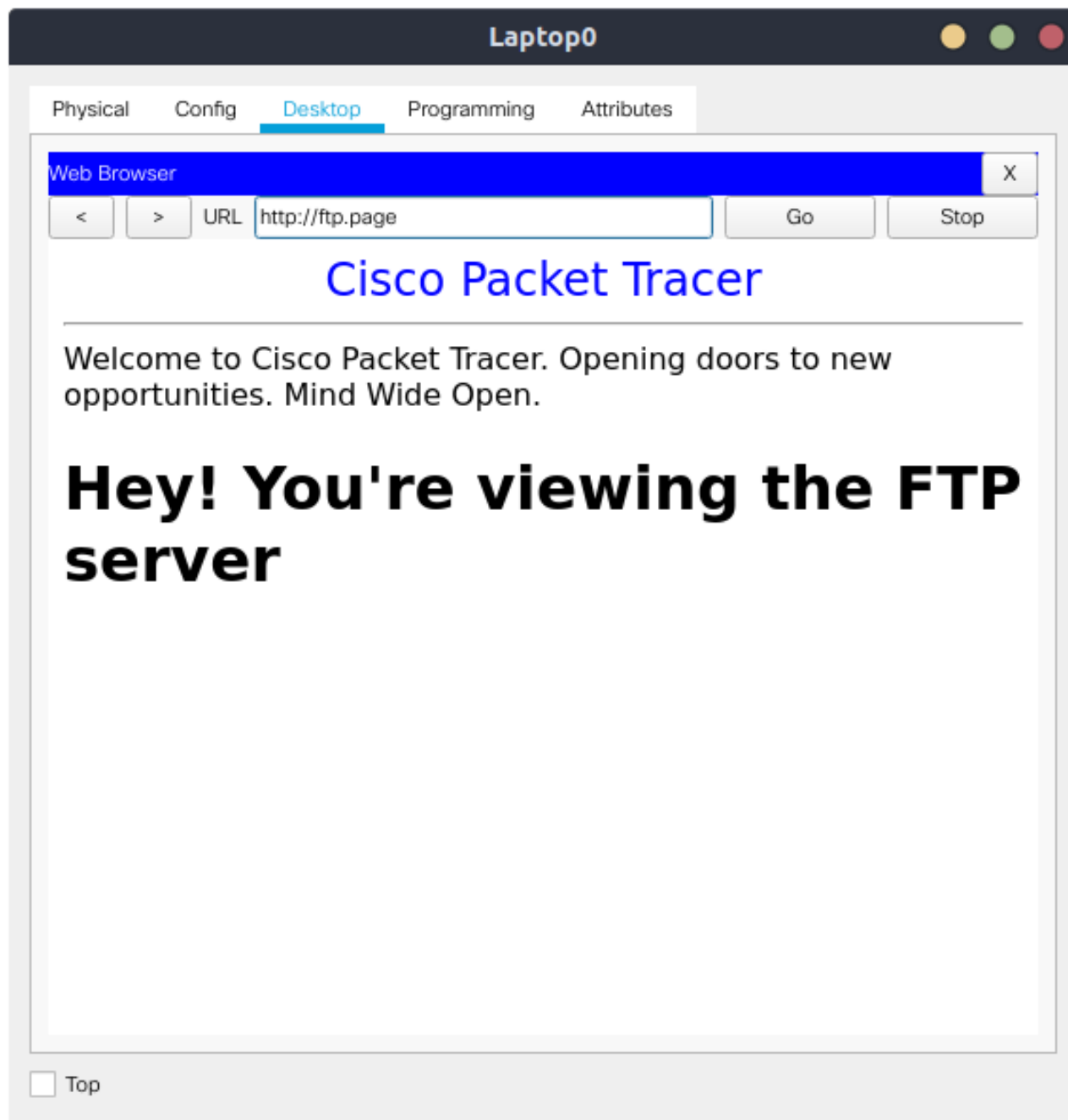
No.	Name	Type	Detail
0	dhcp.page	A Record	192.168.1.1
1	web.page	A Record	192.168.1.3
2	cse.myuniv.edu	A Record	192.168.1.2
3	dns.page	A Record	192.168.1.2
4	ftp.page	A Record	192.168.1.4

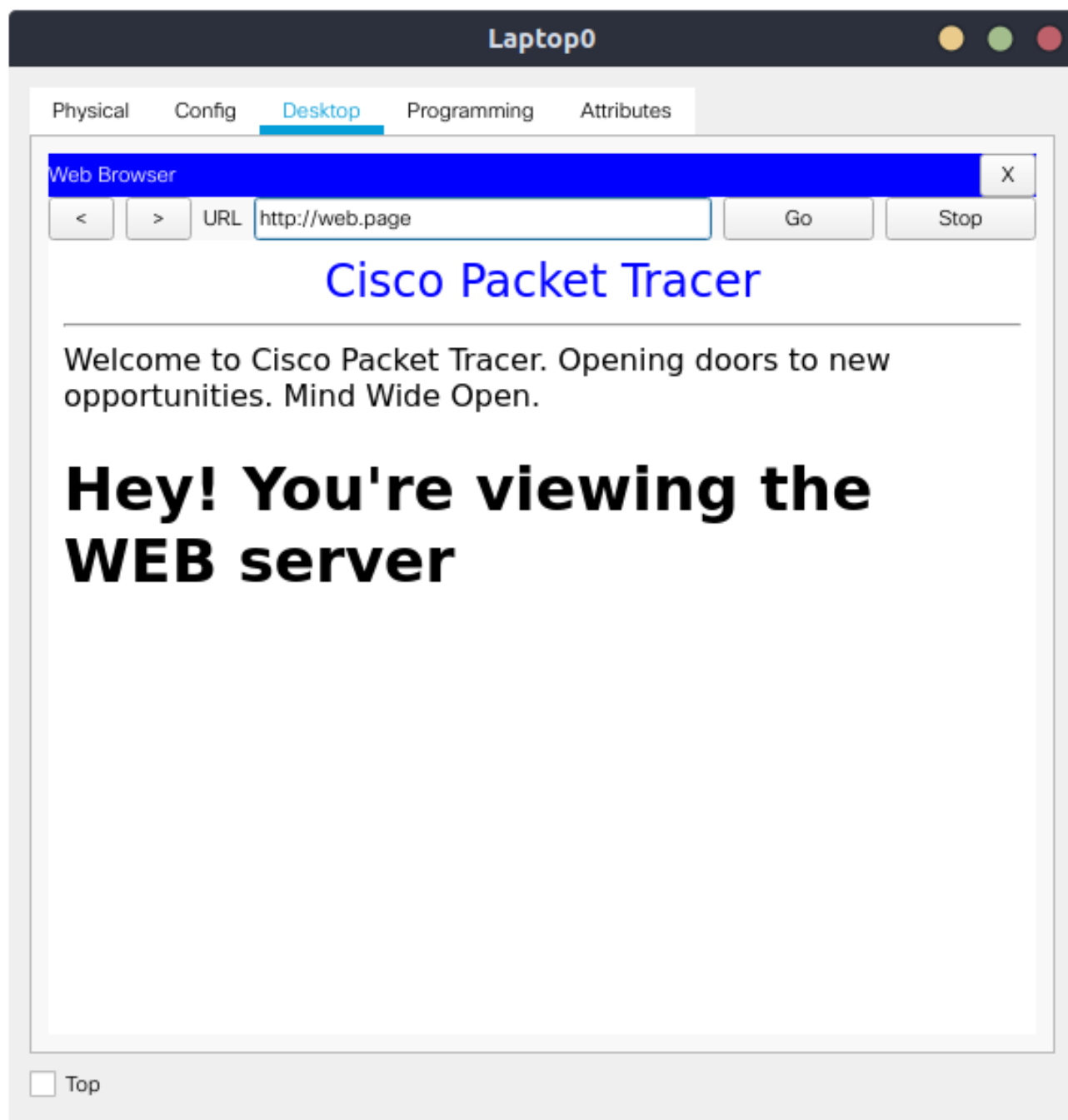
DNS Cache

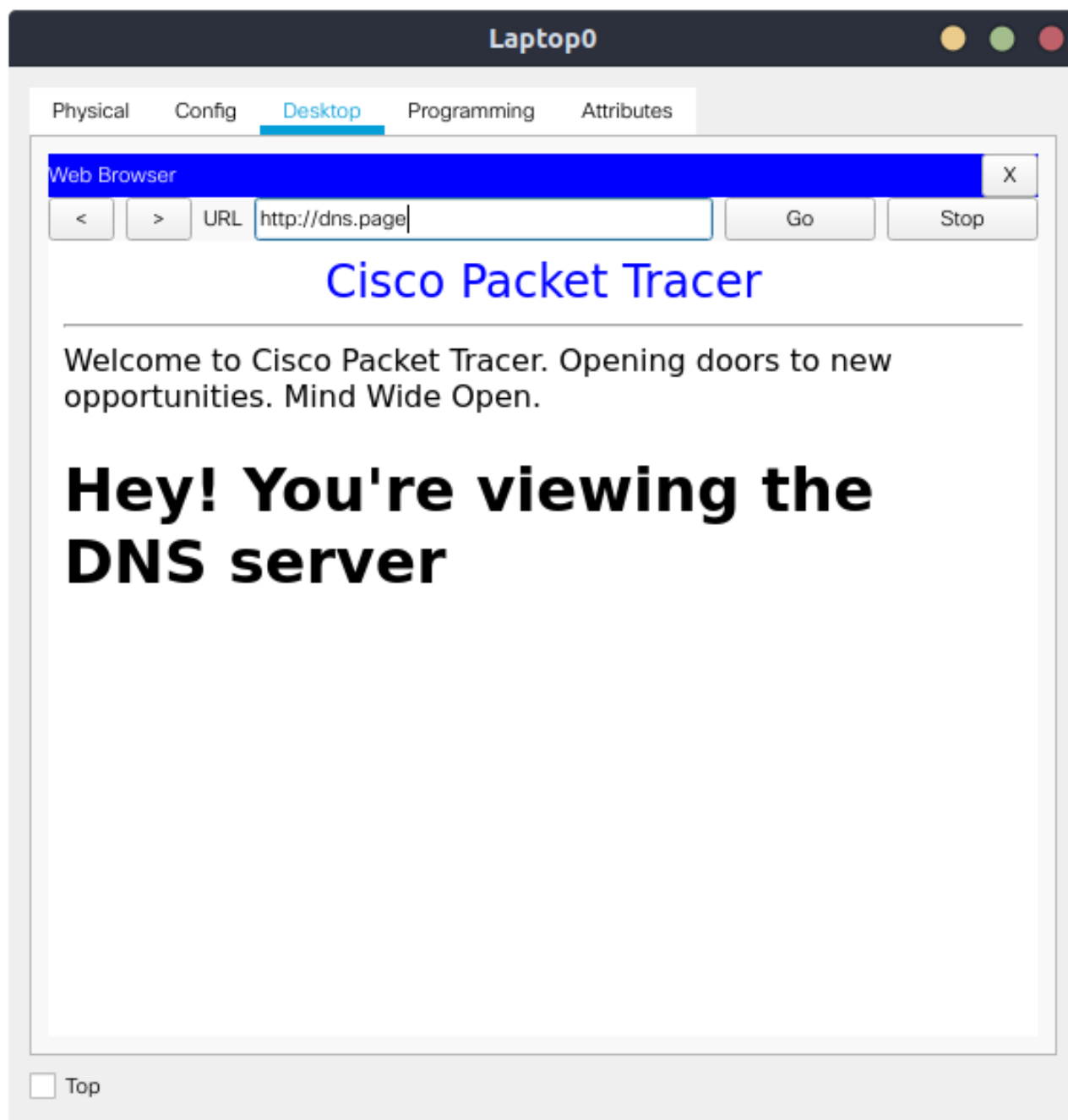
☐ Top

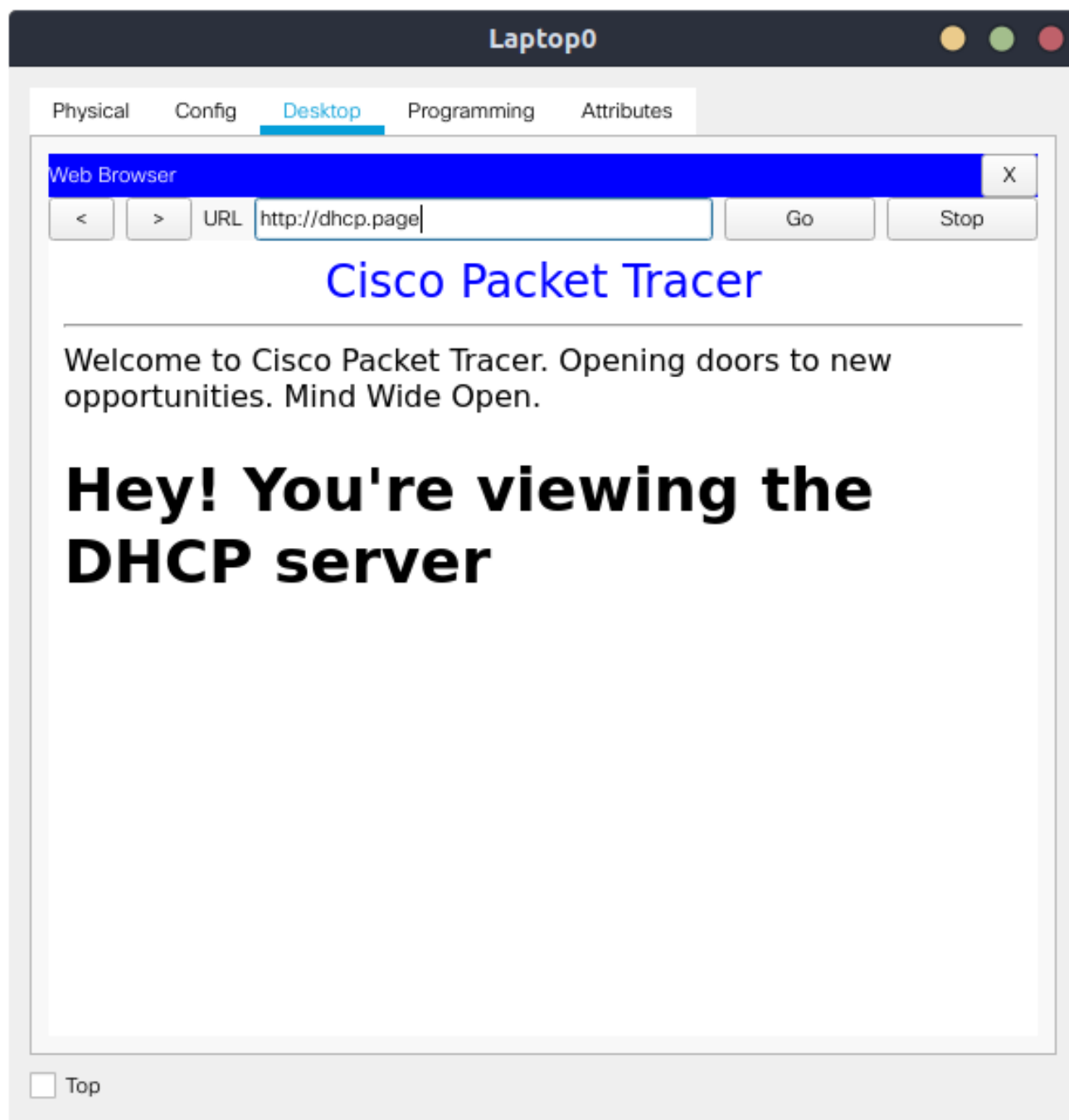
On using the web browser in a host computer connected to the LAN:











Comments

This assignment gave me an immense opportunity to learn an absolutely new software, Cisco Packet Tracer. I had to explore a lot to perform the experiments and it was really a very exciting experience. Overall, I found this assignment very informative.