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CLASS: BCSE-III

GROUP: A1

ASSIGNMENT NUMBER: 6

PROBLEM STATEMENT: Use Cisco Packet Tracer Software to do the given experiments.

DEADLINE: 2nd November, 2021

DATE OF SUBMISSION: 24th November, 2021

OVERVIEW:

Cisco Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface.

SYSTEM DETAILS:

OS: 64-bit Windows 10
Cisco Packet Tracer 8.0.1 (64 bit)

QUESTIONS

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

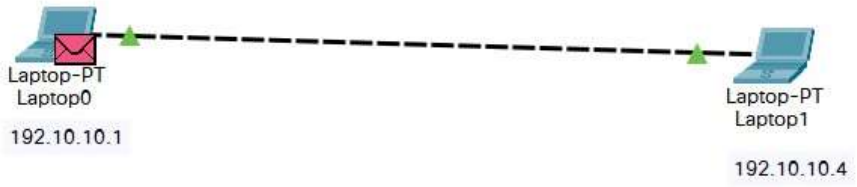
Two laptops Laptop0 and Laptop1 are connected with a cross-over cable. IPv4 addresses are assigned as follows:

Laptop0: 192.10.10.1

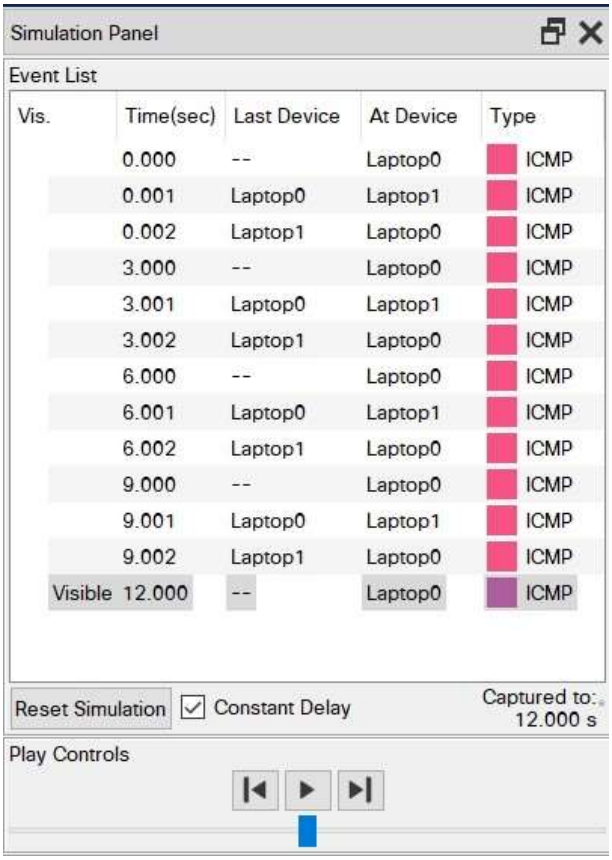
Laptop1: 192.10.10.4

The connection is shown above.

The next screenshots are taken at different times when the laptops were sending pings at regular intervals (3 seconds).

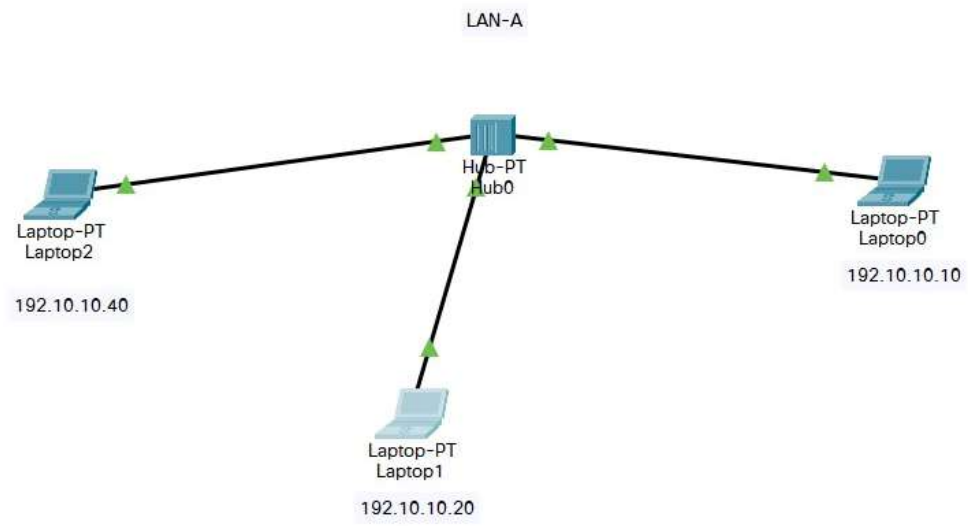


The following screenshot shows the simulation panel capturing up to 12 seconds.

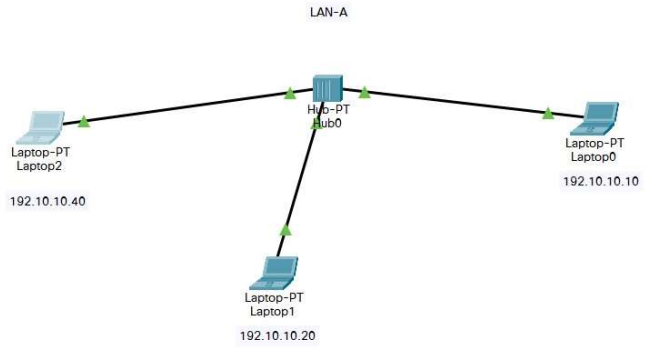


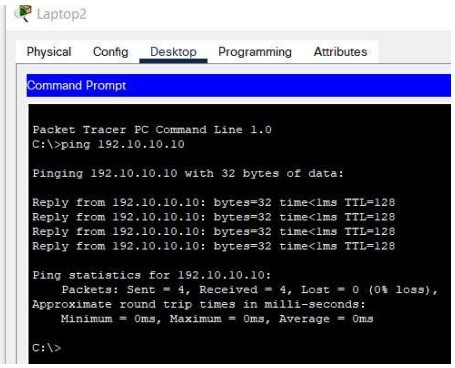
2. Create a LAN (named LAN-A) with 3 hosts using a hub. Ping each pair of nodes.

Three laptops are connected with the hub to form a Local Area Network, LAN-A. The three hosts have been assigned IPv4 addresses 192.10.10.10, 192.10.10.20 and 192.10.10.40.

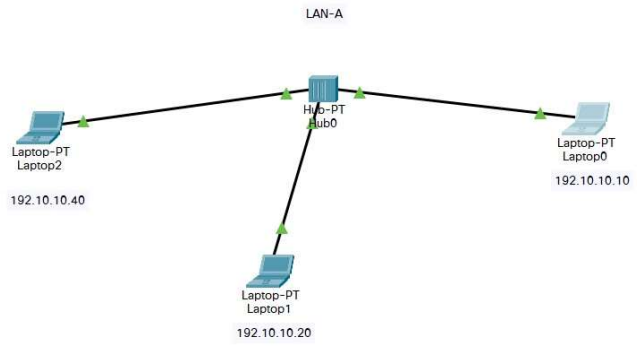


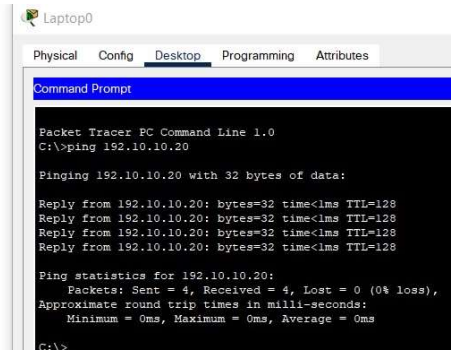
Laptop2 pings Laptop0



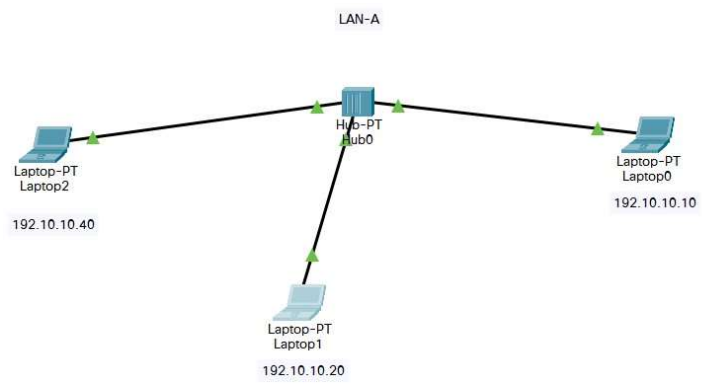


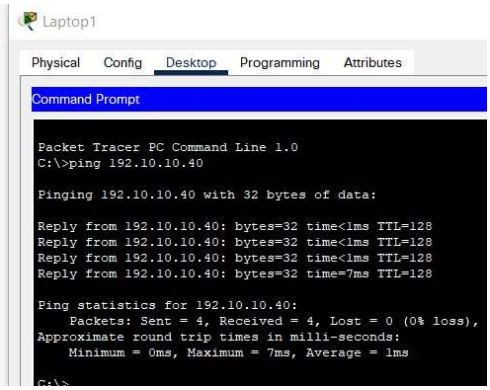
Laptop0 pings Laptop1





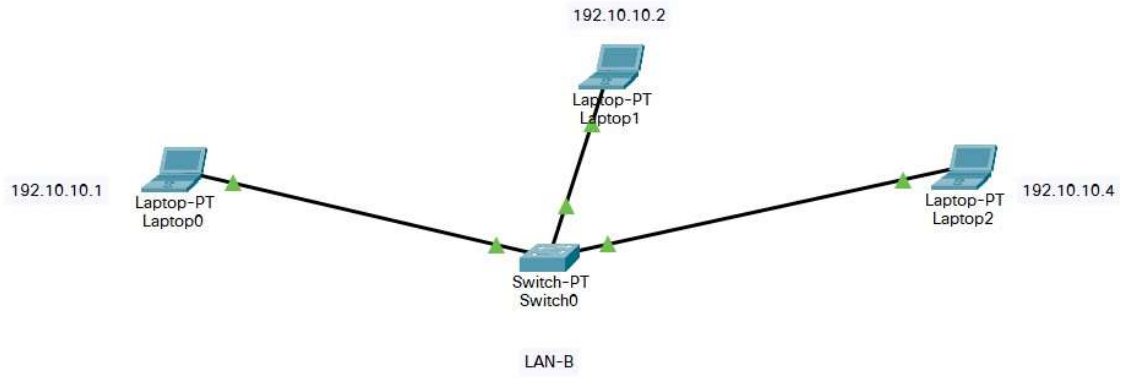
Laptop1 pings Laptop2





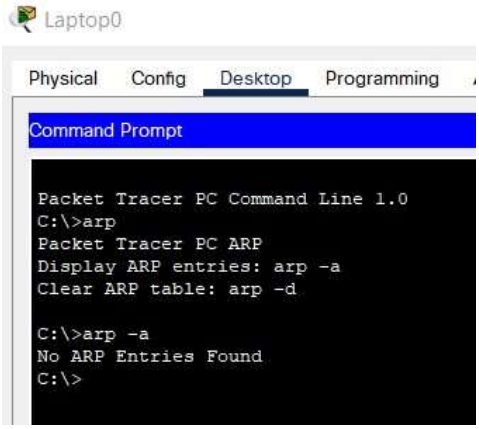
3. Create a LAN (named LAN-B) with 3 hosts using a switch. Record contents of the ARP Table of end hosts and the MAC Forwarding Table of the switch. Ping each pair of nodes. Now record the contents of the ARP Table of end hosts and the MAC Forwarding Table of the switch again.

Three hosts, Laptop0, Laptop1 and Laptop2 are connected using a switch to form a LAN, LAN-B.

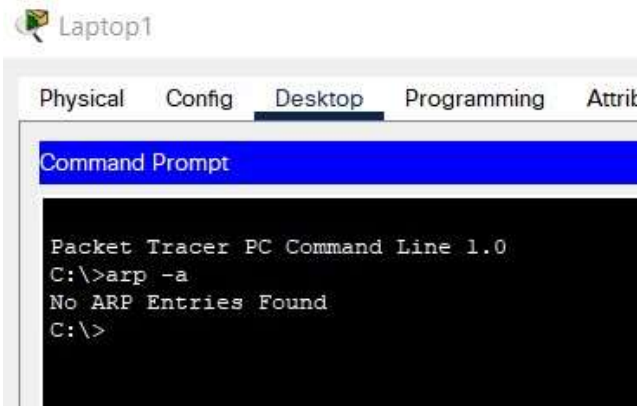


BEFORE PINGING:

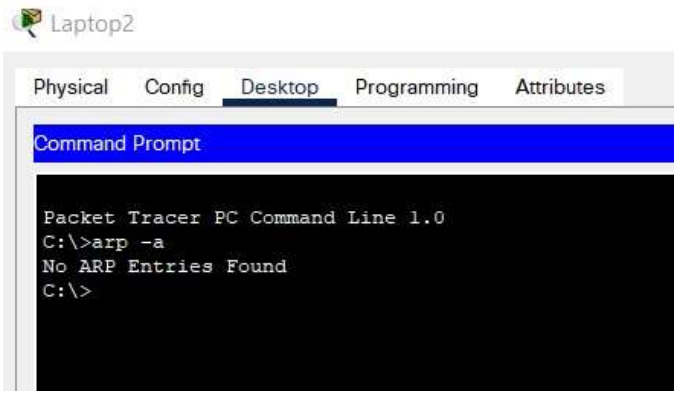
Contents of ARP Table of Laptop0



Contents of ARP Table of Laptop1



Contents of ARP Table of Laptop2

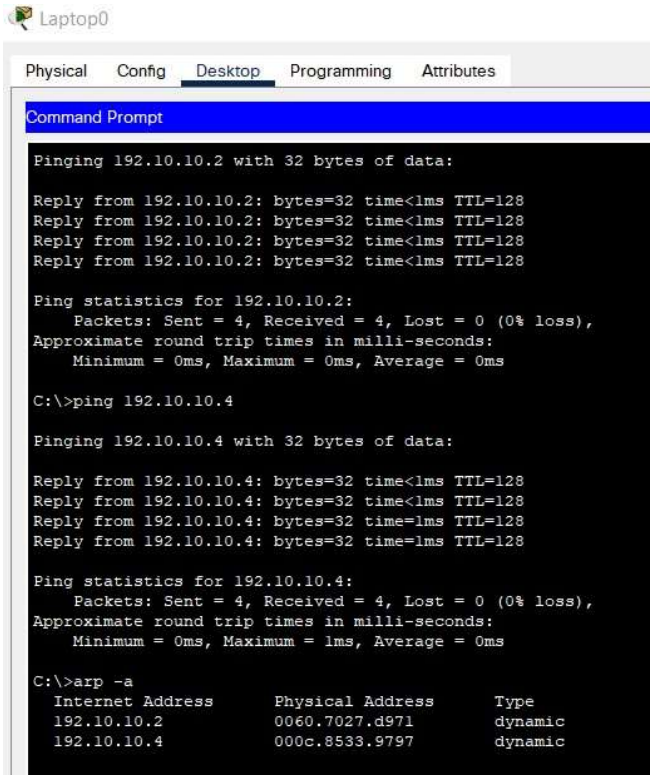


Contents of the MAC forwarding table of the switch

```
%SYS-5-CONFIG_I: Configured from console by console

Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

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

Switch#
```

AFTER PINGING EACH PAIR OF NODES:

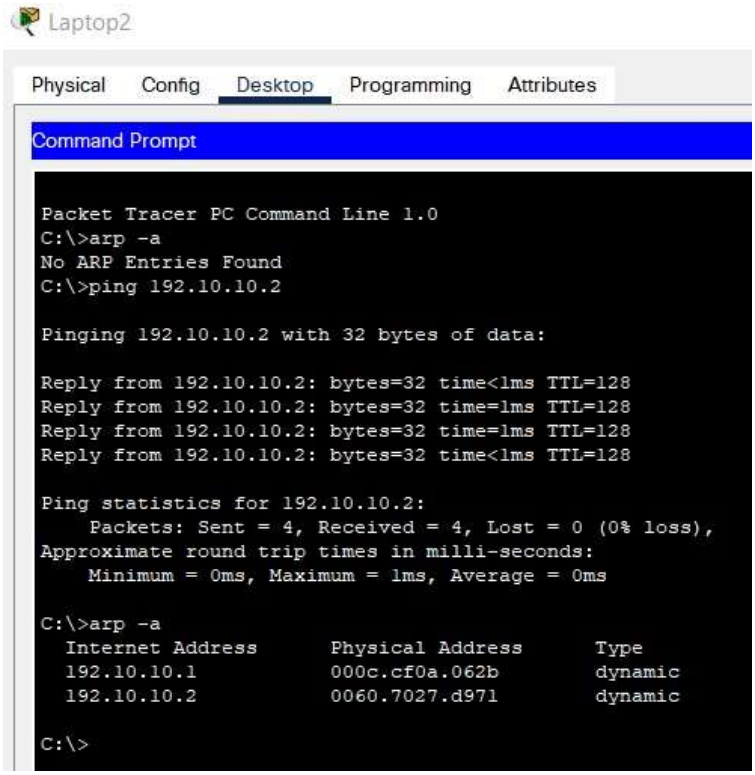
Contents of ARP Table of Laptop0



Contents of ARP Table of Laptop1

```
C:\>arp -a
  Internet Address      Physical Address      Type
  192.10.10.1           000c.cf0a.062b        dynamic
  192.10.10.4           000c.8533.9797        dynamic
```

Contents of ARP Table of Laptop2

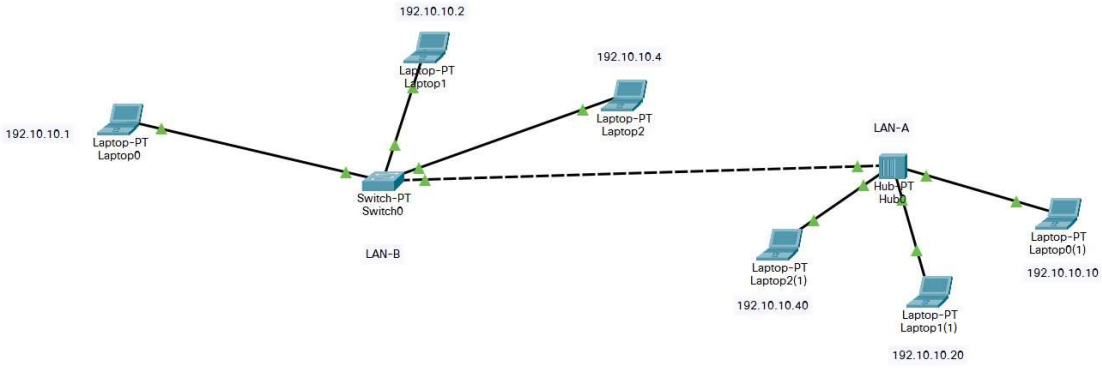


Contents of the MAC forwarding table of the switch

```
Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

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

   1    000c.8533.9797    DYNAMIC     Fa2/1
   1    000c.cf0a.062b    DYNAMIC     Fa0/1
   1    0060.7027.d971    DYNAMIC     Fa1/1
Switch#
```

4. Connect LAN-A and LAN-B by connecting the hub and switch using a cross-over 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 using a cross-over cable between their hub and switch respectively.



After each pair of hosts of LAN-A and LAN-B are pinged,

ARP Table of Laptop0 in LAN-A (192.10.10.1)

Laptop0

Physical Config Desktop Programming Attributes

Command Prompt

```
Reply from 192.10.10.10: bytes=32 time<1ms TTL=128
Reply from 192.10.10.10: bytes=32 time<1ms TTL=128
Reply from 192.10.10.10: bytes=32 time=1ms TTL=128

Ping statistics for 192.10.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.10.10.40

Pinging 192.10.10.40 with 32 bytes of data:

Reply from 192.10.10.40: bytes=32 time<1ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128

Ping statistics for 192.10.10.40:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>arp -a
  Internet Address      Physical Address      Type
  192.10.10.2           0030.a33c.d287        dynamic
  192.10.10.4           00e0.8f01.c8e7        dynamic
  192.10.10.10          000b.be4c.9102        dynamic
  192.10.10.20          0007.ecba.e97b        dynamic
  192.10.10.40          00e0.f964.64d3        dynamic
```

ARP Table of Laptop1 in LAN-A (192.10.10.2)

Laptop1

Physical Config Desktop Programming Attributes

Command Prompt

```
Reply from 192.10.10.10: bytes=32 time<1ms TTL=128
Reply from 192.10.10.10: bytes=32 time<1ms TTL=128
Reply from 192.10.10.10: bytes=32 time=1ms TTL=128

Ping statistics for 192.10.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.10.10.40

Pinging 192.10.10.40 with 32 bytes of data:

Reply from 192.10.10.40: bytes=32 time<1ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128

Ping statistics for 192.10.10.40:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>arp -a
  Internet Address      Physical Address      Type
  192.10.10.1           0060.7007.8885        dynamic
  192.10.10.4           00e0.8f01.c8e7        dynamic
  192.10.10.10          000b.be4c.9102        dynamic
  192.10.10.20          0007.ecba.e97b        dynamic
  192.10.10.40          00e0.f964.64d3        dynamic
```

ARP Table of Laptop2 in LAN-A (192.10.10.4)

Laptop2

Physical Config Desktop Programming Attributes

Command Prompt

```
Reply from 192.10.10.20: bytes=32 time<1ms TTL=128
Reply from 192.10.10.20: bytes=32 time<1ms TTL=128
Reply from 192.10.10.20: bytes=32 time<1ms TTL=128

Ping statistics for 192.10.10.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.10.10.40

Pinging 192.10.10.40 with 32 bytes of data:

Reply from 192.10.10.40: bytes=32 time=3ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128
Reply from 192.10.10.40: bytes=32 time<1ms TTL=128

Ping statistics for 192.10.10.40:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 3ms, Average = 0ms

C:\>arp -a
  Internet Address      Physical Address      Type
  192.10.10.1           0060.7007.8885        dynamic
  192.10.10.2           0030.a33c.d287        dynamic
  192.10.10.10          000b.be4c.9102        dynamic
  192.10.10.20          0007.ecba.e97b        dynamic
  192.10.10.40          00e0.f964.64d3        dynamic
```

ARP Table of Laptop0 in LAN-B (192.10.10.10)

Laptop0(1)

Physical Config Desktop Programming Attributes

Command Prompt

```
Reply from 192.10.10.1: bytes=32 time<1ms TTL=128
Reply from 192.10.10.1: bytes=32 time=1ms TTL=128
Reply from 192.10.10.1: bytes=32 time<1ms TTL=128

Ping statistics for 192.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.10.10.2

Pinging 192.10.10.2 with 32 bytes of data:

Reply from 192.10.10.2: bytes=32 time<1ms TTL=128
Reply from 192.10.10.2: bytes=32 time<1ms TTL=128
Reply from 192.10.10.2: bytes=32 time=16ms TTL=128
Reply from 192.10.10.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 16ms, Average = 4ms

C:\>arp -a
  Internet Address      Physical Address      Type
  192.10.10.1           0060.7007.8885        dynamic
  192.10.10.2           0030.a33c.d287        dynamic
  192.10.10.4           00e0.8f01.c8e7        dynamic
  192.10.10.20          0007.ecba.e97b        dynamic
  192.10.10.40          00e0.f964.64d3        dynamic
```

ARP Table of Laptop1 in LAN-B (192.10.10.20)

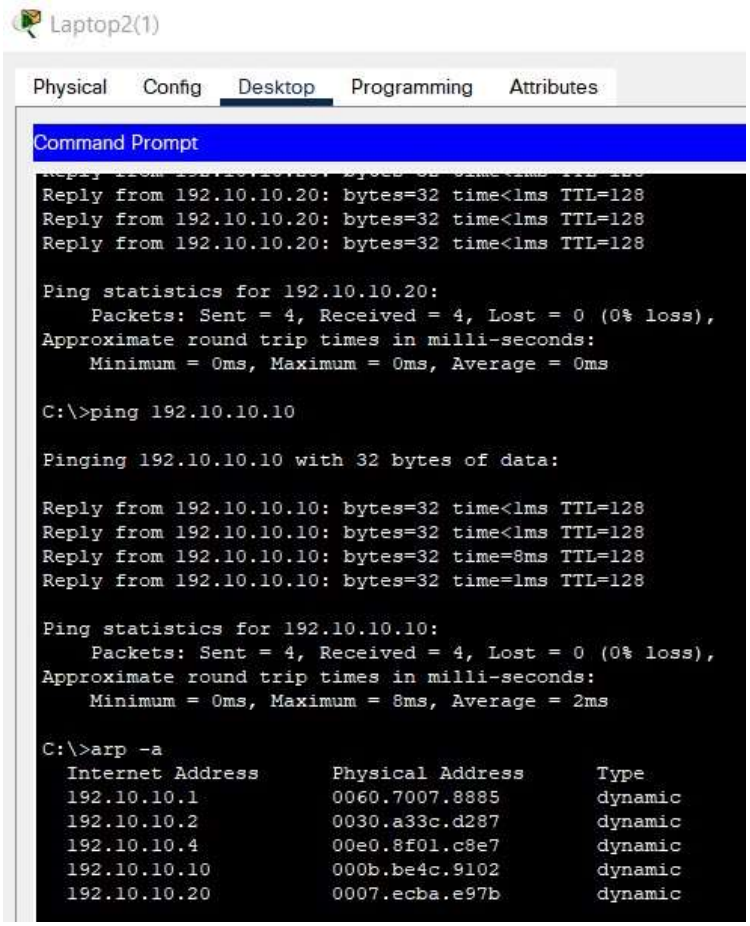
Laptop1(1)

Physical Config Desktop Programming Attributes

Command Prompt

```
Reply from 192.10.10.2: bytes=32 time<1ms TTL=128
Reply from 192.10.10.2: bytes=32 time<1ms TTL=128
Reply from 192.10.10.2: bytes=32 time=1ms TTL=128

Ping statistics for 192.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.10.10.10

Pinging 192.10.10.10 with 32 bytes of data:

Reply from 192.10.10.10: bytes=32 time<1ms TTL=128
Reply from 192.10.10.10: bytes=32 time=1ms TTL=128
Reply from 192.10.10.10: bytes=32 time<1ms TTL=128
Reply from 192.10.10.10: bytes=32 time<1ms TTL=128

Ping statistics for 192.10.10.10:
    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
  192.10.10.1           0060.7007.8885        dynamic
  192.10.10.2           0030.a33c.d287        dynamic
  192.10.10.4           00e0.8f01.c8e7        dynamic
  192.10.10.10          000b.be4c.9102        dynamic
  192.10.10.40          00e0.f964.64d3        dynamic
```

ARP Table of Laptop2 in LAN-B (192.10.10.40)



MAC Forwarding Table of the switch (switch0)

```
Switch#show mac-address-table
          Mac Address Table
-------------------------------------------

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

   1    0007.ecba.e97b    DYNAMIC     Fa3/1
   1    000b.be4c.9102    DYNAMIC     Fa3/1
   1    0030.a33c.d287    DYNAMIC     Fa1/1
   1    0060.7007.8885    DYNAMIC     Fa0/1
   1    00e0.8f01.c8e7    DYNAMIC     Fa2/1
   1    00e0.f964.64d3    DYNAMIC     Fa3/1
Switch#
```

The hub is connected to port Fa3/1 using cross-over cable. The hosts Laptop0, Laptop1 and Laptop2 in LAN-A are connected to the switch at ports Fa0/1, Fa1/1 and Fa2/1 respectively.

5. 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 hosts 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 hosts 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.

LAN named JU-Main is created with three hosts, PC0, PC1 and PC2 connected using PC-LAB1-Switch (Cisco 2950T-24). The switch is connected to a router, Router0 (Cisco 2911 --- Cisco 1818 is not available in current version of Packet Tracer). IP Addresses are assigned as follows:

PC0: 192.168.148.1 PC1: 192.168.148.2 PC2: 192.168.148.3

Router0 Interface connected to JU-Main: 192.168.148.4

The default gateway for each host is configured as 192.168.148.4.

LAN named JU-SL is created with three hosts, PC3, PC4 and PC5 connected using PC-LAB2-Switch (Cisco 2950T-24). The switch is connected to a router, Router1 (Cisco 2911 --- Cisco 1818 is not available in current version of Packet Tracer). IP Addresses are assigned as follows:

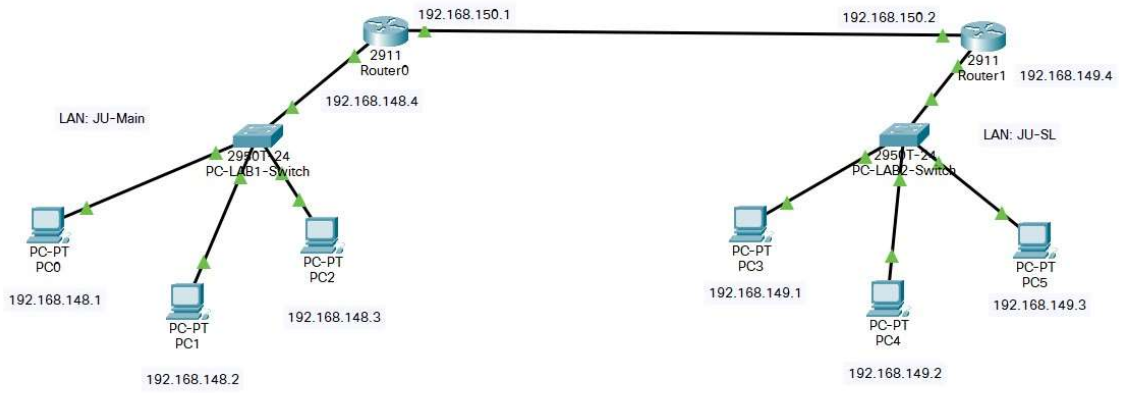
PC3: 192.168.149.1 PC4: 192.168.149.2 PC5: 192.168.149.3

Router1 Interface connected to JU-SL: 192.168.149.4

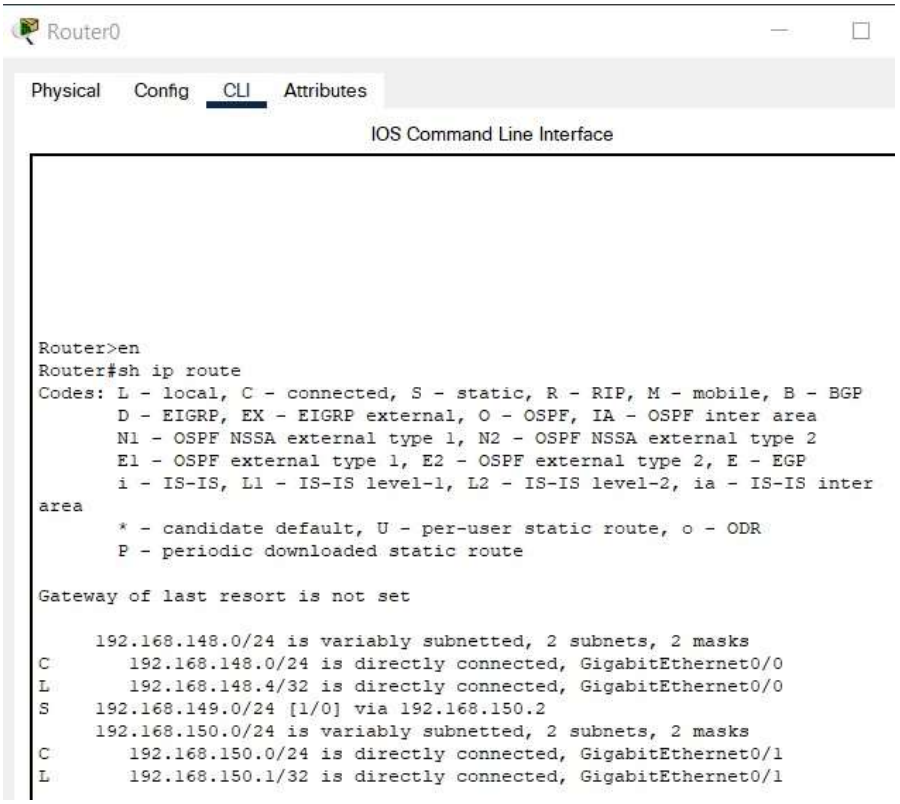
The default gateway for each host is configured as 192.168.149.4.

WAN Interface of Router0 is assigned IP Address 192.168.150.1 while WAN Interface of Router1 is assigned IP Address 192.168.150.2.

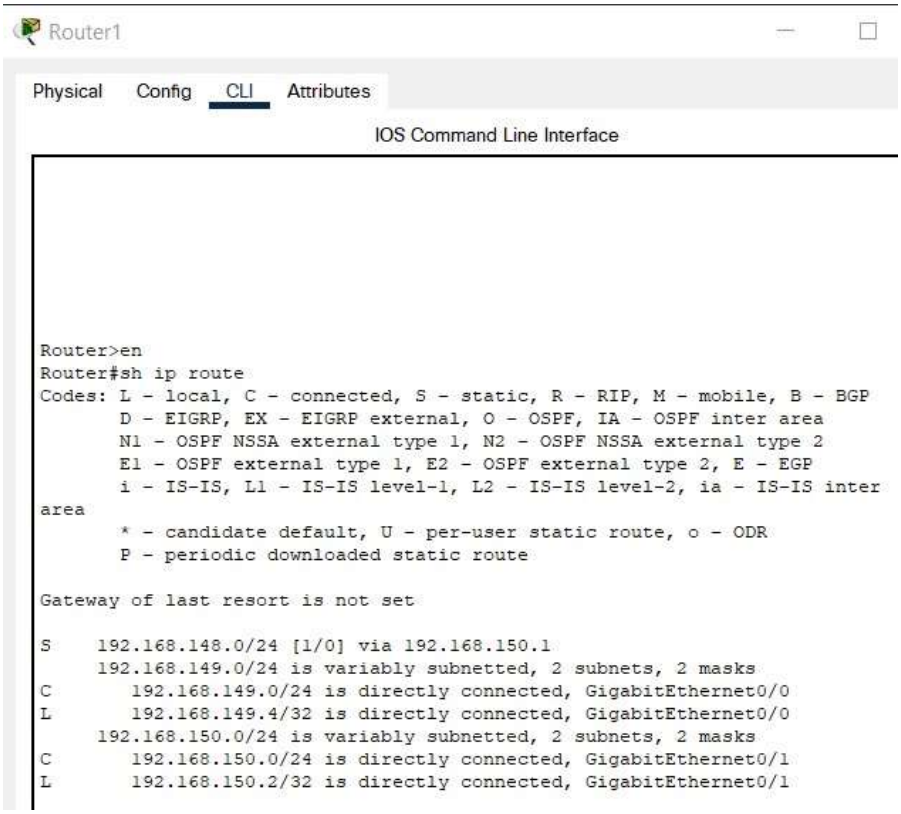
Static Route is added in both routers to route packets between JU-Main and JU-SL.



Router0 IP Route

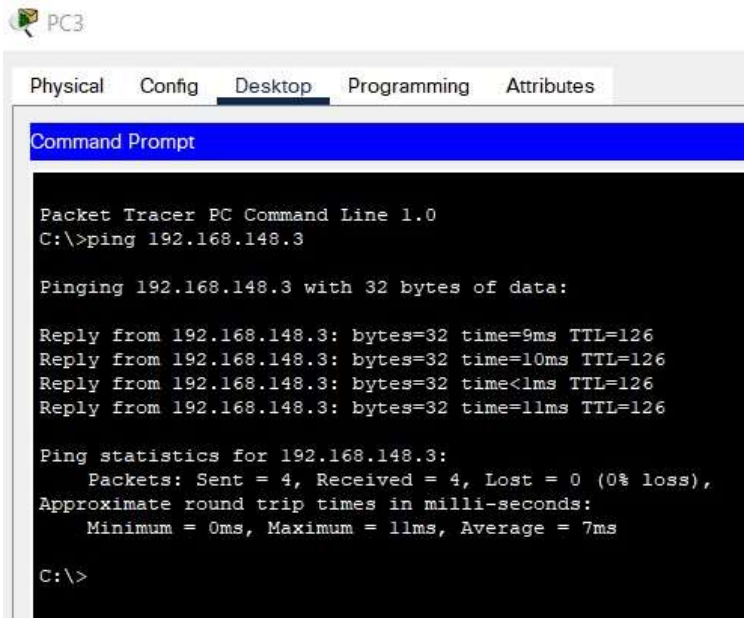


Router1 IP Route

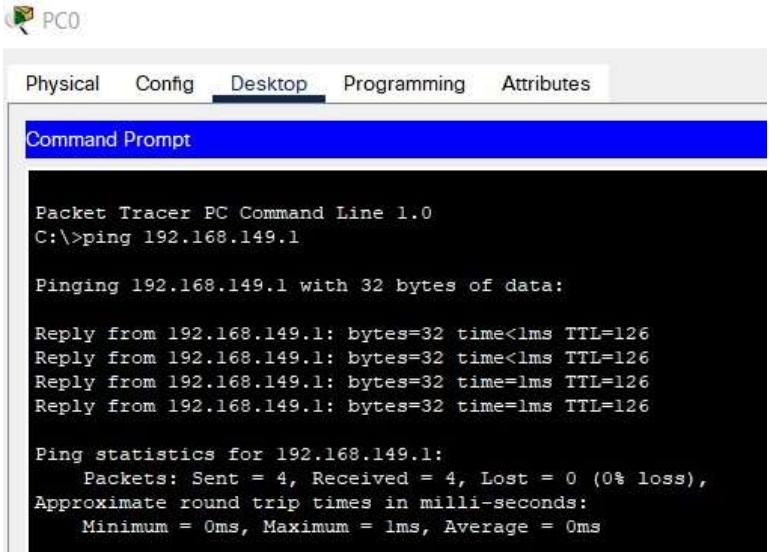


To check whether packets can be successfully routed between the LANs,

1. Ping PC2 (JU-Main) from PC3 (JU-SL)

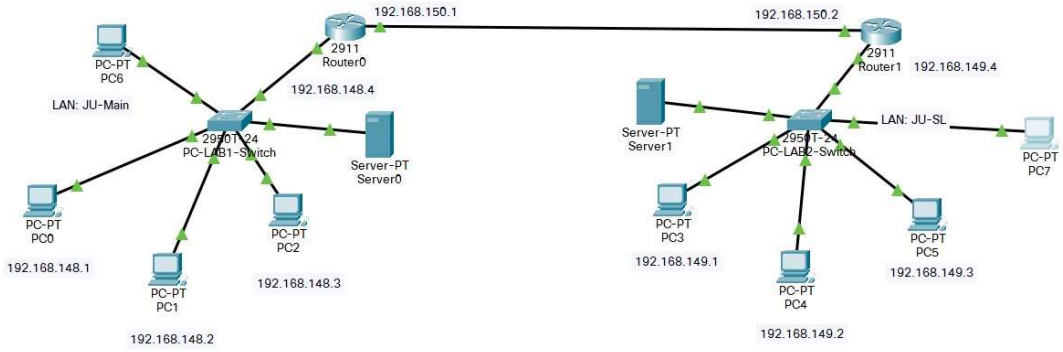


2. Ping PC3 (JU-SL) from PC0 (JU-Main)

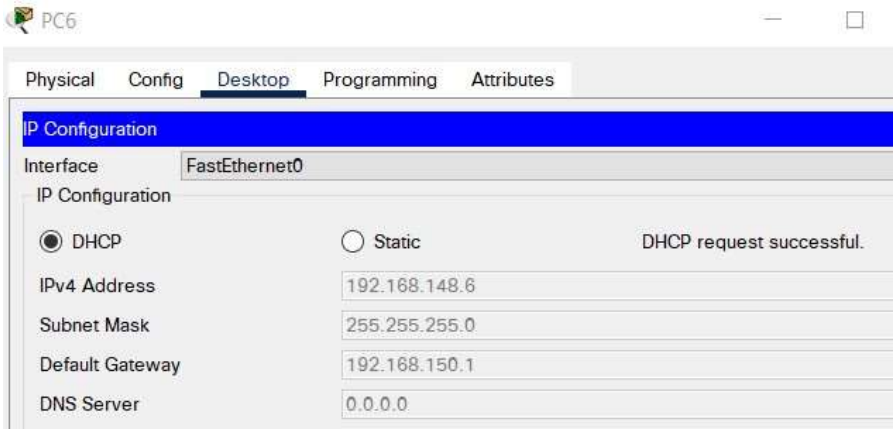


6. Add servers to the individual LANs (in problem 5) and configure them as a DHCP server. Configure the hosts in the individual LAN to obtain IP addresses and address of the default gateway via this DHCP server.

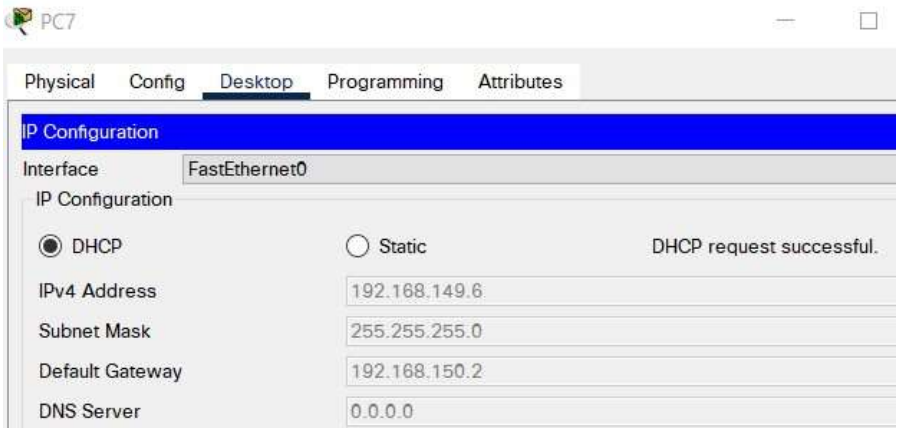
Server0 and Server1 are added to the LANs, JU-Main and JU-SL, respectively and configured as DHCP servers. A new host is added to each LAN so that we can check whether IP addresses are properly assigned to them by the DHCP server.



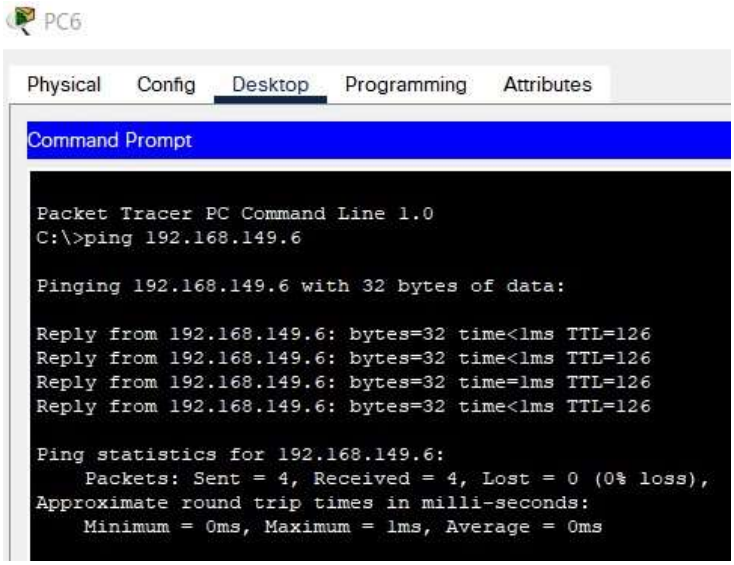
A new PC (PC6) is added to JU-Main and assigned IP Address 192.168.148.6 by the server.



A new PC (PC7) is added to JU-SL and assigned IP Address 192.168.149.6 by the server.

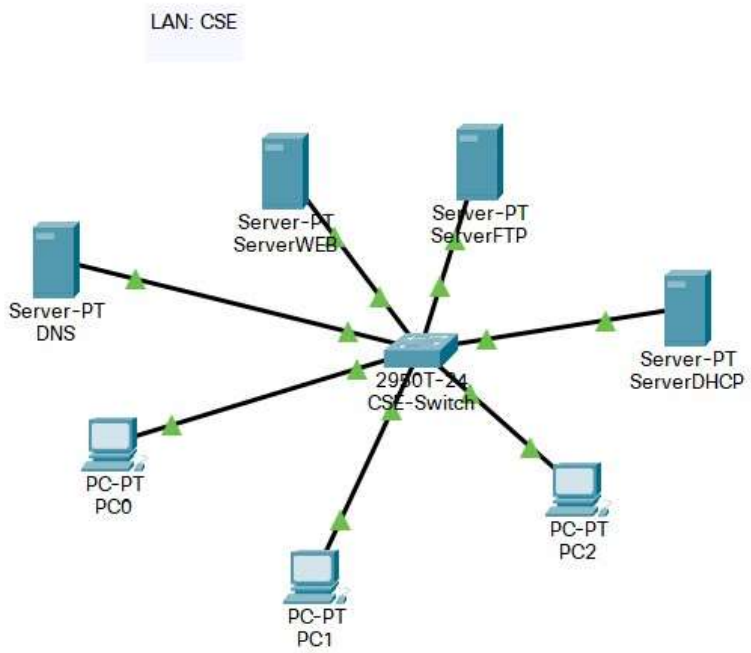


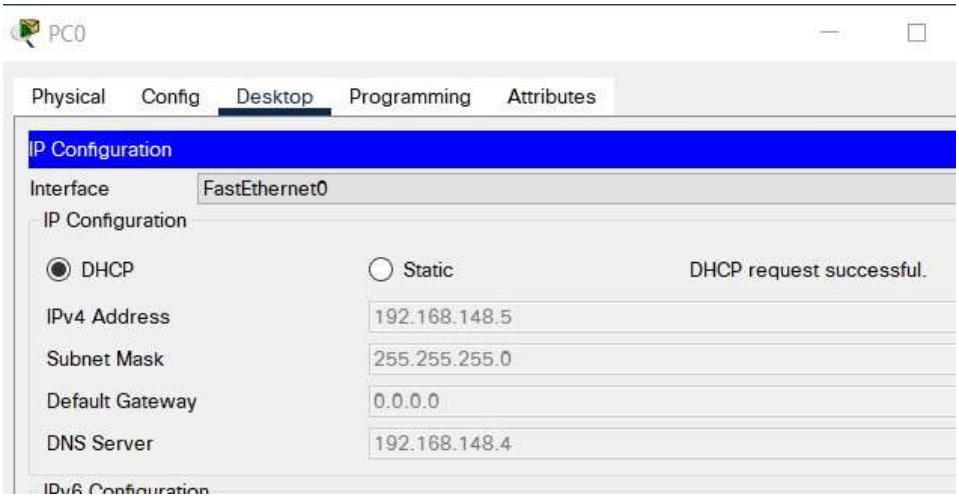
To check the connectivity, we ping PC7 from PC6.

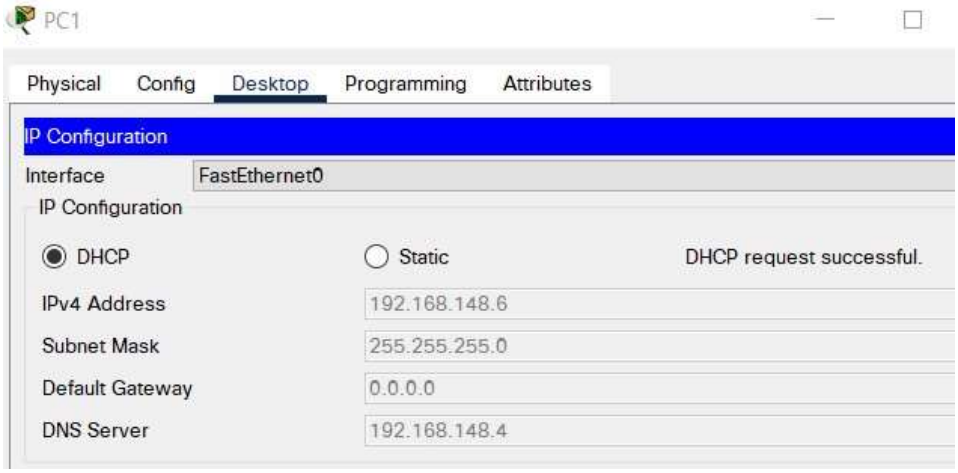


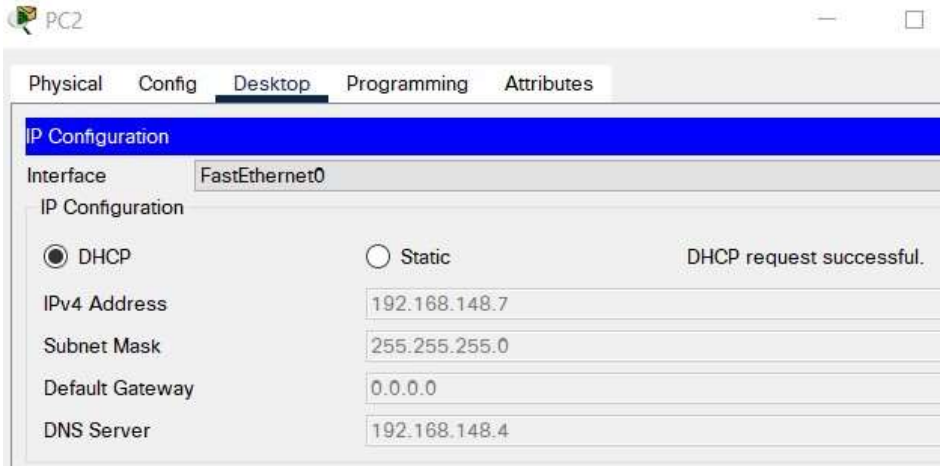
7. Create a LAN (CSE) with three hosts connected via a layer-2 switch (Cisco 2950 switch CSE-Switch). Also add a web server and a ftp server to this LAN. The hosts dynamically get their IP addresses from a local DHCP server. Servers are assigned fixed IP addresses. Configure the individual hosts to use 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.

Three hosts PC0, PC1 and PC2 are connected using Cisco 2950 switch, CSE-Switch. ServerDHCP is the local DHCP Server and is assigned IP Address 192.168.148.1. ServerWEB is the web server (192.168.148.2) and ServerFTP is the FTP Server (192.168.148.3). DNS is the local DNS Server added (192.168.148.4). The hosts dynamically get their IP Addresses from ServerDHCP and are configured to use DNS (192.168.148.4) for name resolution.



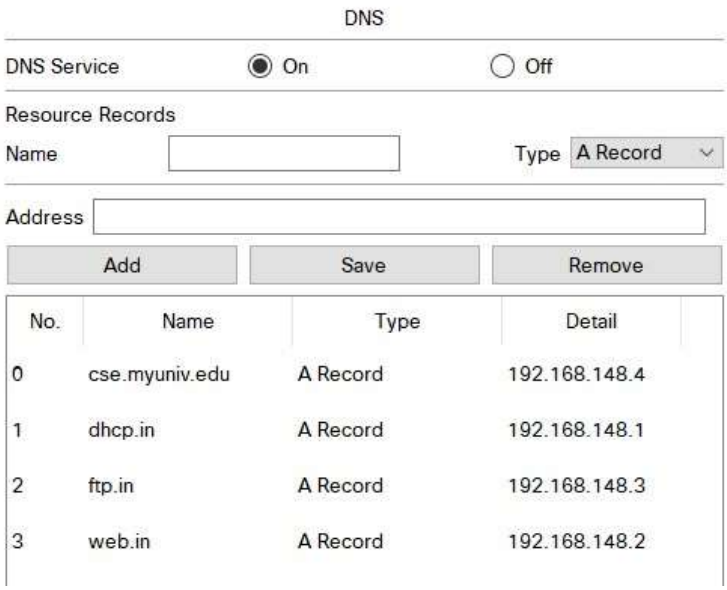




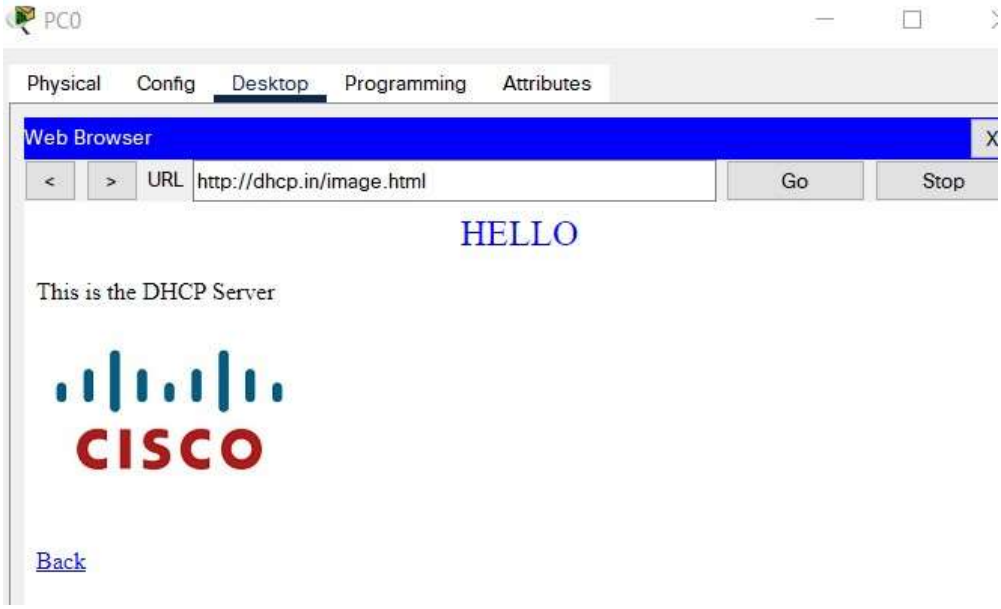


The local DNS server is used for name resolution.

Records in the local DNS Server:



For checking the working of the name resolution, a host (PC0) uses the web browser to go to the image page for each server by using the name of the server.



COMMENTS

This assignment was very interesting and it helped me to easily explore how data traverses through a network. Designing and building networks of various sizes was a good way to practice the topics we learnt about in our theory class and simulate the real-world networks and how they are connected to each other. I also learnt how to work with the Cisco Packet Tracer tool and the experience was highly rewarding.