

Experiment 1

Layer 2: Data Link Layer

“.. we learn by doing...”

Names:

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Part I

Note: When answering the following please support your results by including (cut-paste) your obtained PT results as in the example shown in the last page.

Step 6

Proceed with Capture/Forward instance to answer the following questions:

- a. Enter the MAC address and the IP address of the source and destination of the outbound first message.

Source is PC12

Destination is DHCP router

After selecting DHCP on PC12, the communication between the PC12 and DHCP server starts. Following are the snaps of outbound first message for both the PC12 and the DHCP server.

The screenshot displays two windows from the Packet Tracer application. The left window, titled 'PDU Information at Device: PC12', shows the 'Outbound PDU Details' tab. It details an Ethernet II frame with a preamble, destination MAC address of FFFF.FFFF.FF, source MAC address of 6.2A10.722E, and a data payload. Below the Ethernet frame, the IP packet details are shown, including source IP 0.0.0.0, destination IP 255.255.255.255, and a length of 42. The right window, titled 'Simulation Panel', shows the 'Event List' tab. It contains a table with columns for Visibility, Time (sec), Last Device, At Device, Type, and Info. The first entry shows a DHCP event at 0.000 seconds, originating from PC12. Below the table are controls for 'Reset Simulation', 'Constant Delay', and 'Play Controls' (Back, Auto Capture / Play, Capture / Forward).

Vis.	Time(sec)	Last Device	At Device	Type	Info
	0.000	--	PC12	DHCP	

PDU Information at Device: PC12

OSI Model Outbound PDU Details

PDU Formats

LENGTH:42		CHECKSUM:0	
DATA (VARIABLE LENGTH)			
DHCP			
0	8	16	24
OP:0x00000000 00000001	HW TYPE:1	HW LEN:6	HOPS:0
TRANSACTION ID			
SECS:0		FLAGS:0x00000000000000000000000000000000	
CLIENT ADDRESS:0.0.0.0			
YOUR CLIENT ADDRESS:0.0.0.0			
SERVER ADDRESS:0.0.0.0			
RELAY AGENT ADDRESS:0.0.0.0			
CLIENT HARDWARE ADDRESS (16 BYTES)			
SERVER HOSTNAME (64 BYTES)			
FILE (128 BYTES)			
OPTIONS (312 BYTES)			

b. What is the IP address assigned for PC1?

IP address assigned to PC1 is 190.1.0.26

PC1

Physical Config Desktop Programming Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Bluetooth

FastEthernet0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 00D0.BC3A.5CE7

IP Configuration

☒ DHCP

☐ Static

IP Address 190.1.0.26

Subnet Mask 255.255.255.192

IPv6 Configuration

☐ DHCP

☐ Auto Config

☒ Static

IPv6 Address

Link Local Address: FE80::2D0:BCFF:FE3A:5CE7

☐ Top

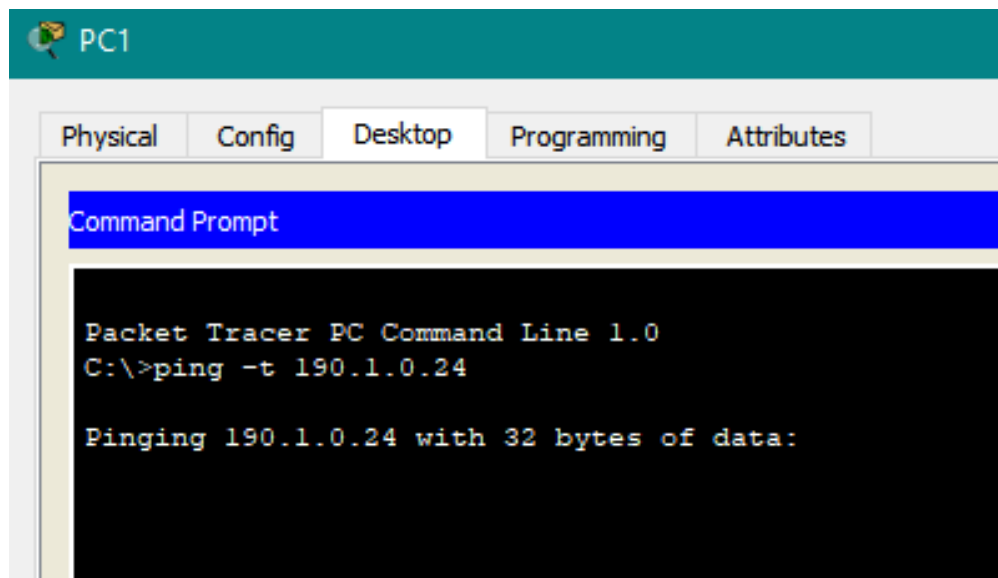
-
- c. Why there were so many packets being dropped by other hosts in the LAN?

Since, the hosts of other LANs initially are not aware of the devices connected to them they send it as received. It is called flooding. Once the other hosts in LAN know the devices there is no dropping of packets.

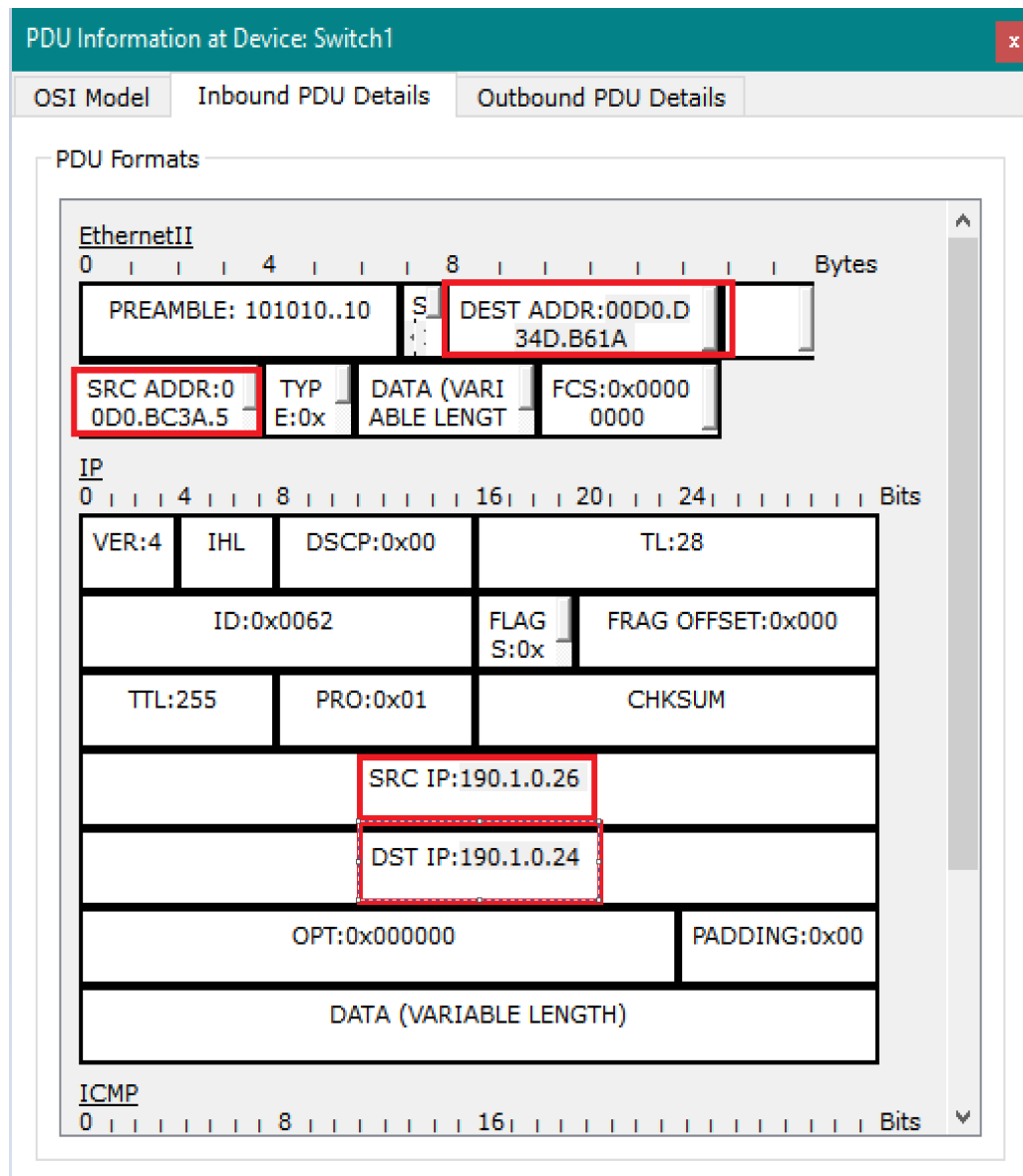
Step 7

- a. In the simulation mode set the *Event list* filter to ICMP only to reduce the number of messages exchanged, then enter the IP and MAC addresses of the source and destination of the 1st 7 messages (outbound and inbound) that are crossing the root-BRIDGE (Switch1)

To perform this step, we are doing a continuous ping from PC1 (190.1.0.26) to PC10 (190.1.0.24). And the Inbound and outbound ICMP packets at the Switch 1 are captured. The snaps of only 1st and last Inbound and outbound details is attached for reference.



Inbound



PDU Information at Device: Switch1

OSI Model

Inbound PDU Details

Outbound PDU Details

PDU Formats

EthernetII

0 4 8 Bytes

PREAMBLE: 101010..10

DEST ADDR:00D0.BC3A.5CE7

SRC ADDR:00D0.D34D.B61A

TYP:0x00

DATA (VARIABLE LENGTH)

FCS:0x00000000

IP

0 4 8 16 20 24 Bits

VER:4

IHL

DSCP:0x00

TL:128

ID:0x0040

FLAG S:0x00

FRAG OFFSET:0x0000

TTL:128

PRO:0x01

CHKSUM

SRC IP:190.1.0.24

DST IP:190.1.0.26

OPT:0x000000

PADDING:0x00

DATA (VARIABLE LENGTH)

ICMP

0 8 16 Bits

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type	Info
	1.195	Hub2	PC11	ICMP	
	1.195	Hub2	PC10	ICMP	
	1.195	Hub2	PC12	ICMP	
	1.196	PC10	Hub2	ICMP	
	1.197	Hub2	PC11	ICMP	
	1.197	Hub2	PC12	ICMP	
	1.197	Hub2	Switch0	ICMP	
	1.198	Switch0	Switch1	ICMP	

Reset Simulation

☒ Constant Delay

Captured to: 1.198 s

Play Controls

Back

Auto Capture / Play

Capture / Forward

Event List Filters - Visible Events

ICMP

Edit Filters

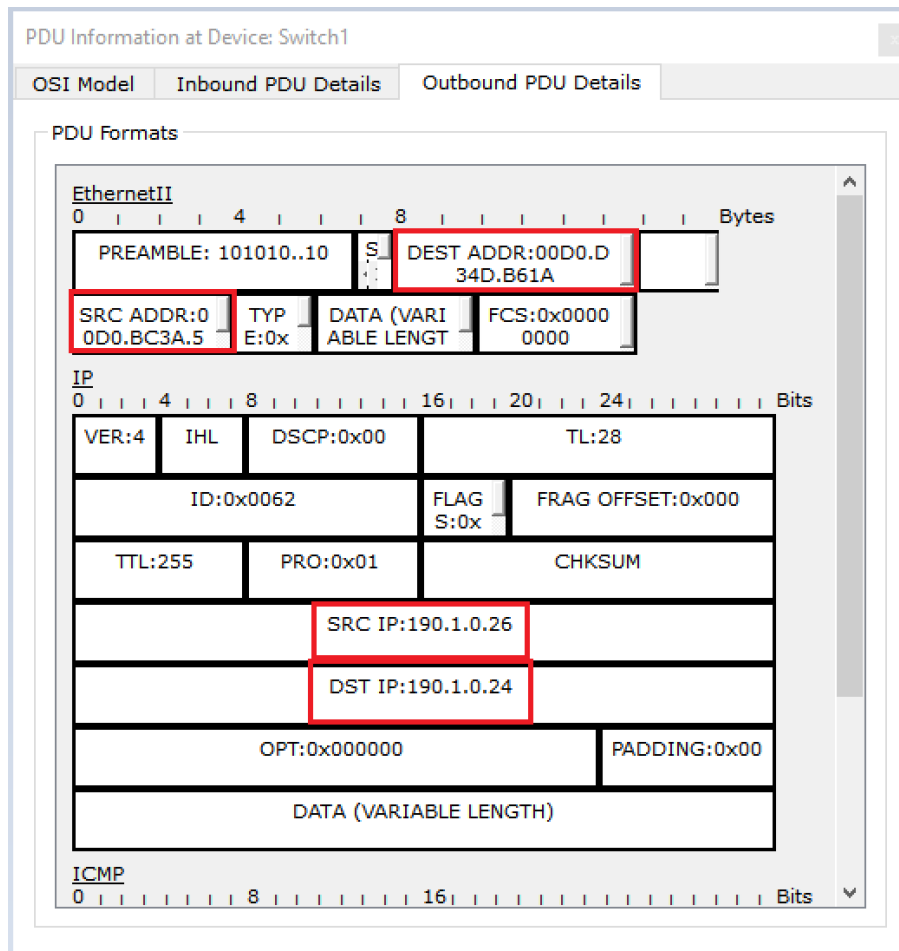
Show All/None

Event List

Simul

Pkt	MAC address	IP address
source	00D0.BC3A.5CE7	190.1.0.26
destination	00D0.D34D.B61A	190.1.0.24
source	00D0.D34D.B61A	190.1.0.24
destination	00D0.BC3A.5CE7	190.1.0.26
source	00D0.BC3A.5CE7	190.1.0.26
destination	00D0.D34D.B61A	190.1.0.24
source	00D0.D34D.B61A	190.1.0.24
destination	00D0.BC3A.5CE7	190.1.0.26
source	00D0.BC3A.5CE7	190.1.0.26
destination	00D0.D34D.B61A	190.1.0.24
source	00D0.D34D.B61A	190.1.0.24
destination	00D0.BC3A.5CE7	190.1.0.26
source	00D0.BC3A.5CE7	190.1.0.26
destination	00D0.D34D.B61A	190.1.0.24

Outbound



PDU Information at Device: Switch1

OSI Model Inbound PDU Details Outbound PDU Details

PDU Formats

EthernetII

0 4 8 Bytes

PREAMBLE: 101010..10 SRC ADDR: 00D0.D34D.B DEST ADDR: 00D0.BC3A.5CE7

SRC ADDR: 00D0.D34D.B TYP E: 0x DATA (VARIABLE LENGTH) FCS: 0x00000000

IP

0 4 8 16 20 24 Bits

VER: 4 IHL DSCP: 0x00 TL: 128

ID: 0x0040 FLAG S: 0x FRAG OFFSET: 0x000

TTL: 128 PRO: 0x01 CHKSUM

SRC IP: 190.1.0.24

DST IP: 190.1.0.26

OPT: 0x000000 PADDING: 0x00

DATA (VARIABLE LENGTH)

ICMP

0 8 16 Bits

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type	Info
	1.195	Hub2	PC11	ICMP	
	1.195	Hub2	PC10	ICMP	
	1.195	Hub2	PC12	ICMP	
	1.196	PC10	Hub2	ICMP	
	1.197	Hub2	PC11	ICMP	
	1.197	Hub2	PC12	ICMP	
	1.197	Hub2	Switch0	ICMP	
	1.198	Switch0	Switch1	ICMP	

Reset Simulation ☒ Constant Delay Captured to: 1.198 s

Play Controls

Back Auto Capture / Play Capture / Forward

Event List Filters - Visible Events

ICMP Edit Filters Show All/None

Event List Simulation

<i>Pkt</i>	<i>MAC address</i>	<i>IP address</i>
<i>source</i>	00D0.BC3A.5CE7	190.1.0.26
<i>destination</i>	00D0.D34D.B61A	190.1.0.24
<i>source</i>	00D0.D34D.B61A	190.1.0.24
<i>destination</i>	00D0.BC3A.5CE7	190.1.0.26
<i>source</i>	00D0.BC3A.5CE7	190.1.0.26
<i>destination</i>	00D0.D34D.B61A	190.1.0.24
<i>source</i>	00D0.D34D.B61A	190.1.0.24
<i>destination</i>	00D0.BC3A.5CE7	190.1.0.26
<i>source</i>	00D0.BC3A.5CE7	190.1.0.26
<i>destination</i>	00D0.D34D.B61A	190.1.0.24
<i>source</i>	00D0.D34D.B61A	190.1.0.24
<i>destination</i>	00D0.BC3A.5CE7	190.1.0.26
<i>source</i>	00D0.BC3A.5CE7	190.1.0.26
<i>destination</i>	00D0.D34D.B61A	190.1.0.24

- a. When comparing the result in part(a) which addresses stayed the same and which address have been modified. Explain. [Use the PDU information to comment on MAC and IP address behavior from the source to the destination]

To perform this step, we are pinging continuously from PC1 (190.1.0.26) to PC1 (190.1.0.24). And the Inbound and outbound ICMP packets at the Switch 1 are captured.

When the ping is initiated from PC1 to PC10, following is the IP and MAC address observed at switch 1:

<i>Pkt</i>	<i>MAC address</i>	<i>IP address</i>
<i>source</i>	00D0.BC3A.5CE7	190.1.0.26
<i>destination</i>	00D0.D34D.B61A	190.1.0.24

After the ICMP packet reaches PC10, there is reply from PC10 to PC1, following is the IP and MAC address observed at switch 1:

<i>Pkt</i>	<i>MAC address</i>	<i>IP address</i>
<i>source</i>	00D0.D34D.B61A	190.1.0.24
<i>destination</i>	00D0.BC3A.5CE7	190.1.0.26

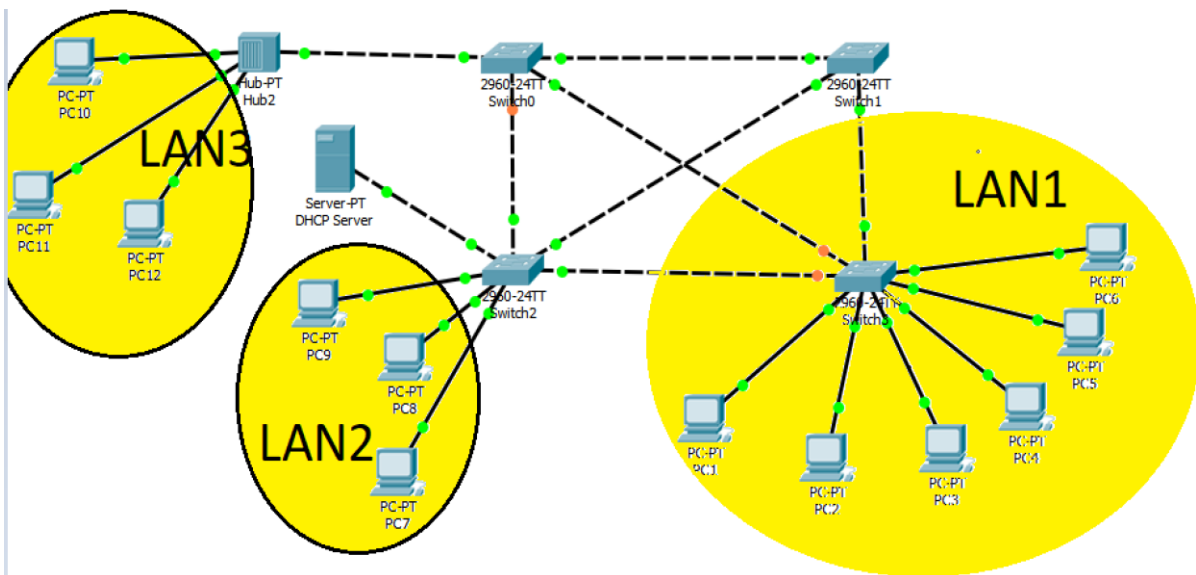
Observation: The Source and Destination IP as well as MAC address changes when the ICMP packets are being exchanged between PC1 and PC10.

Part II

Step 6

What are the percentage of packet lost in LAN1 and LAN3? Explain/reason why they are different.

Continuous ping Initiated for PC1 to PC6, PC7 to PC9 and PC12 to PC10. Following are the observations:



Percentage Loss:

LAN 1: 0% loss in LAN1

LAN3: 6% loss in LAN3

Due to Hub being present in LAN3, packets are sent to all the connected devices instead of destination and hence collision or timeout occurs and there's a loss of packet observed. Hence the difference.

Bonus Question

Note you can, and are encouraged, to use Packet-Tracer features to carry out this part and observe the animated behavior of both LAN scenarios. (I leave it as bonus)

To answer this, we have captured a video and uploaded on youtube for viewing but it will be only visible to the audience who has this link. Following is the link to access the video:

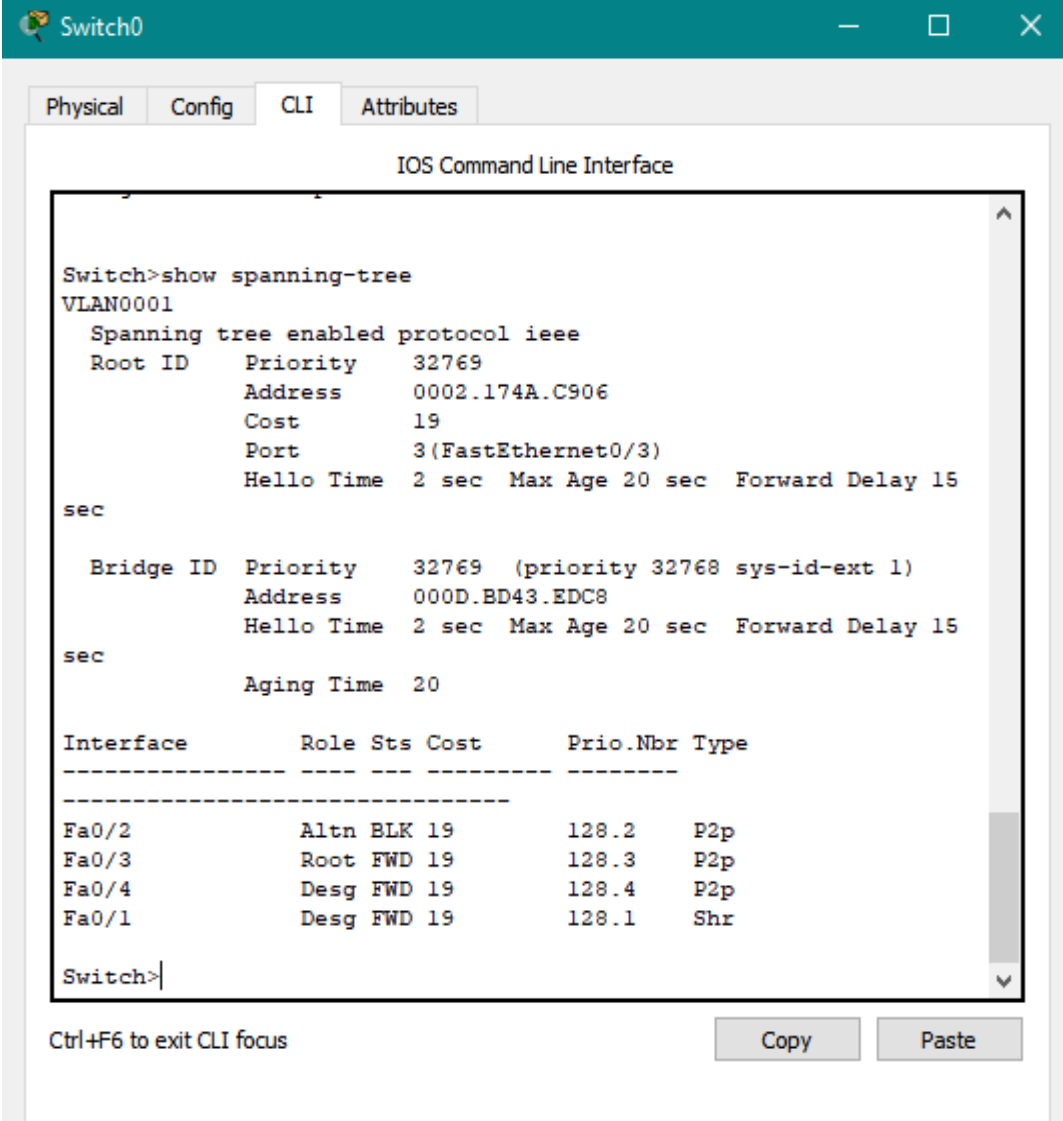
https://youtu.be/t_shpw2_oeY

PART III

Step 2

- a. Use Step1 to determine the root-bridge and its MAC address in your network.

Switch 2 is the root bridge. Following are the snaps attached:



The screenshot shows a network switch window titled "Switch0" with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the output of the command "show spanning-tree". The output shows that the spanning tree is enabled for VLAN0001 using the IEEE protocol. The root bridge has ID 32769, priority 32769, and MAC address 0002.174A.C906. The local bridge has ID 32769, priority 32768, and MAC address 000D.BD43.EDC8. The aging time is 20 seconds. A table lists the interfaces and their roles in the spanning tree.

```
Switch>show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
    Root ID    Priority    32769
              Address      0002.174A.C906
              Cost        19
              Port        3(FastEthernet0/3)
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15
sec

    Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
              Address      000D.BD43.EDC8
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15
sec

              Aging Time  20

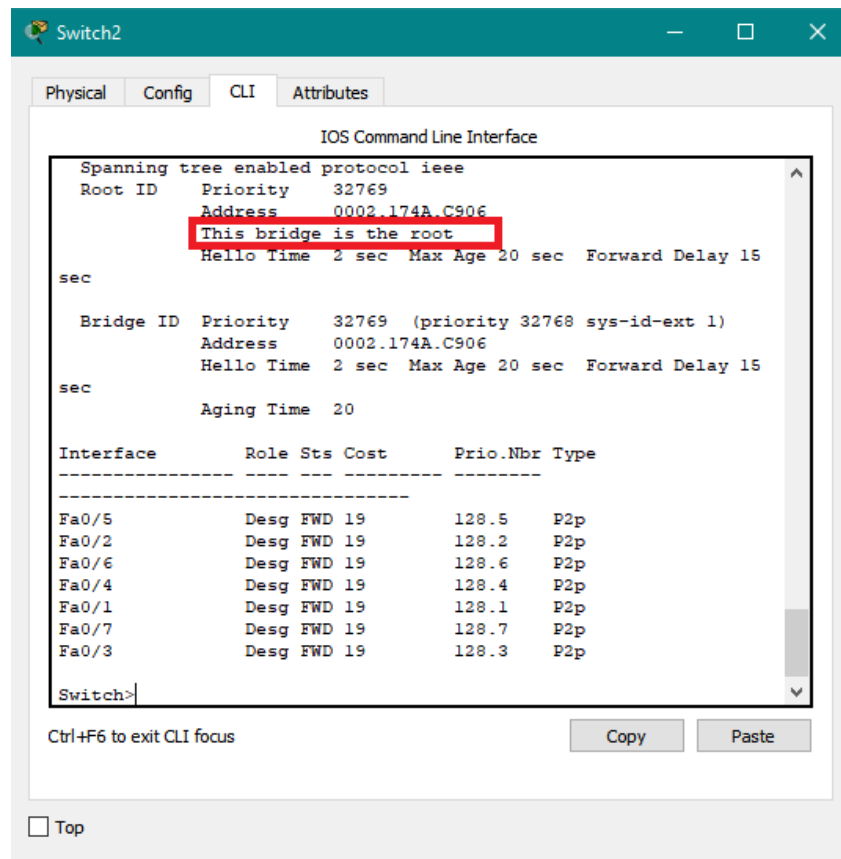
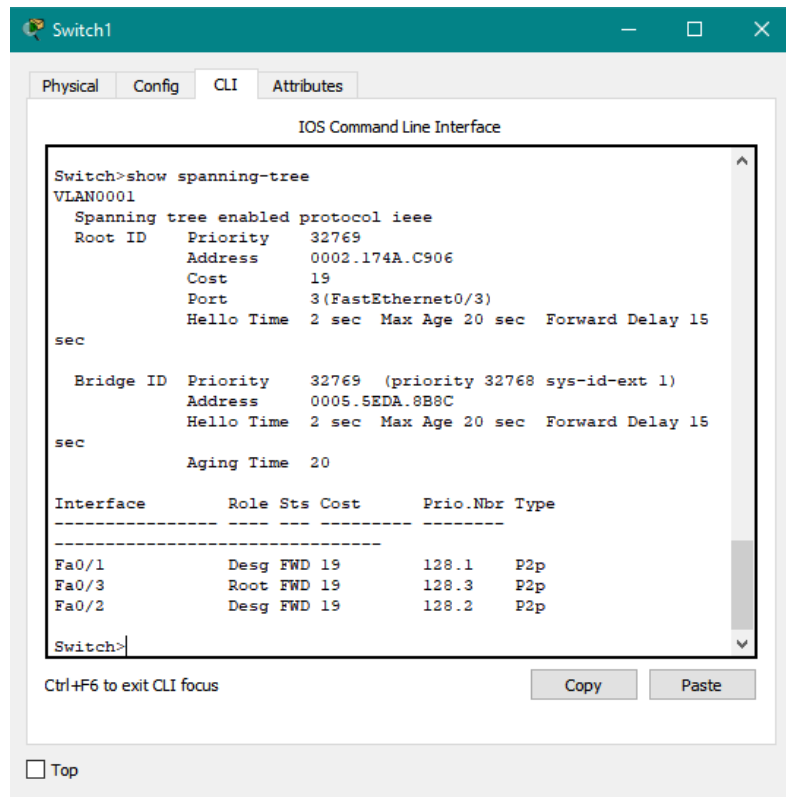
Interface      Role Sts Cost      Prio.Nbr Type
-----
Fa0/2          Altn BLK 19        128.2    P2p
Fa0/3          Root FWD 19        128.3    P2p
Fa0/4          Desg FWD 19        128.4    P2p
Fa0/1          Desg FWD 19        128.1    Shr

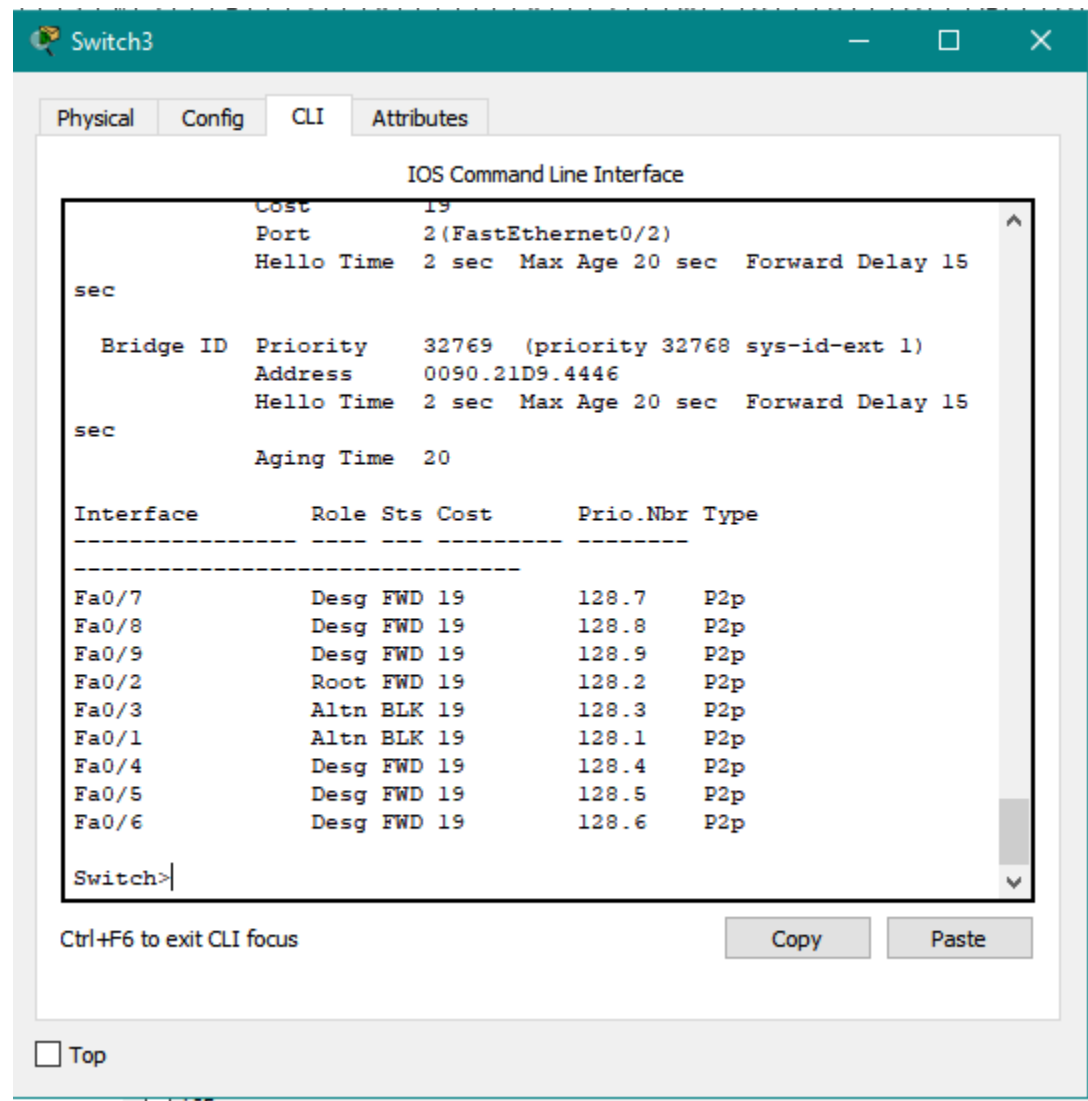
Switch>
```

Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top





- b. Compare the bridge priority values of your other four switches.

Switch0:

```

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 000D.BD43.EDC8
  
```

Switch1:

```

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0005.5EDA.8B8C
  
```

Switch2:

Bridge ID	Priority	32769	(priority 32768 sys-id-ext 1)
Address		0002.174A.C906	

Switch3:

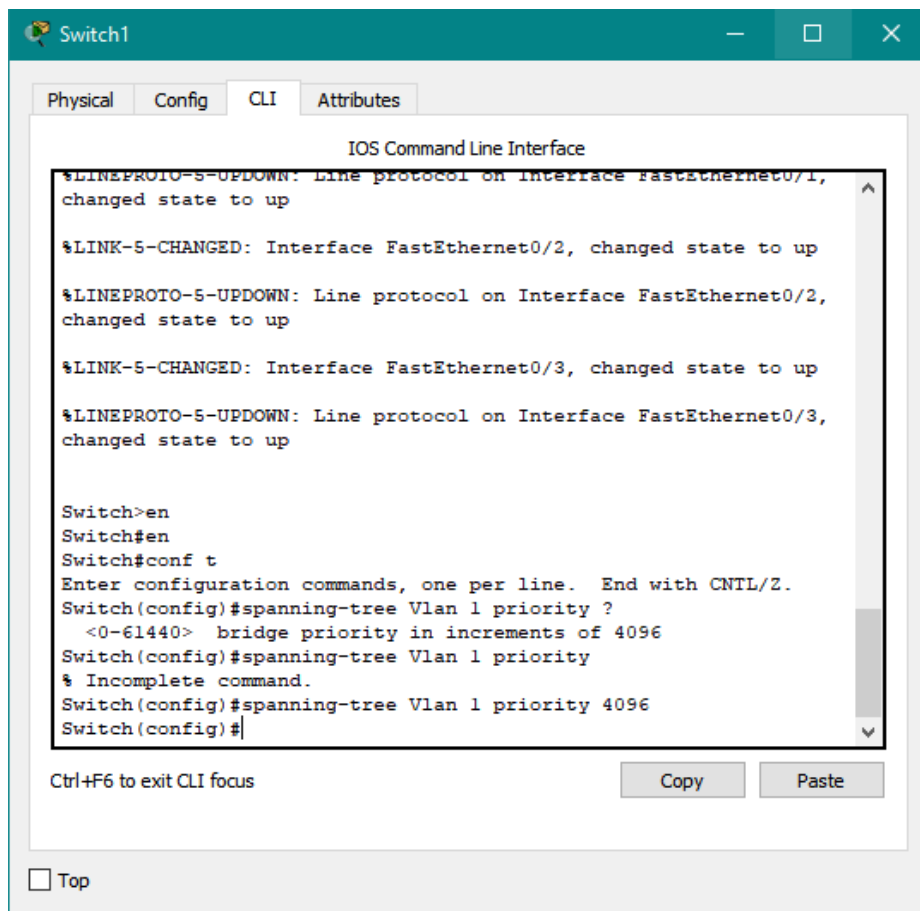
Bridge ID	Priority	32769	(priority 32768 sys-id-ext 1)
Address		0090.21D9.4446	

Step 3

Then show your final result for the new root-bridge (similar to Step 1)

Currently Switch 2 is the root bridge. Now we will make switch 1 as the root bridge.

Following are the commands executed to configure the bridge as root bridge.



```
Switch1
Physical Config CLI Attributes
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
%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3,
changed state to up

Switch>en
Switch#en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#spanning-tree Vlan 1 priority ?
<0-61440> bridge priority in increments of 4096
Switch(config)#spanning-tree Vlan 1 priority
% Incomplete command.
Switch(config)#spanning-tree Vlan 1 priority 4096
Switch(config)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

☐ Top

Following is the result after execution of the commands

The screenshot shows a network switch window titled 'Switch1' with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the 'IOS Command Line Interface'. The command 'Switch#show spanning-tree' has been executed, showing the following output:

```
Switch#show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    4097
            Address     0005.5EDA.8B8C
            This bridge is the root
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15
            sec

  Bridge ID  Priority    4097 (priority 4096 sys-id-ext 1)
            Address     0005.5EDA.8B8C
            Hello Time 2 sec  Max Age 20 sec  Forward Delay 15
            sec

            Aging Time 20

Interface    Role Sts Cost      Prio.Nbr Type
-----
Fa0/2        Desg FWD 19        128.2    P2p
Fa0/1        Desg FWD 19        128.1    P2p
Fa0/3        Desg FWD 19        128.3    P2p

Switch#
```

Below the CLI window, there is a 'Ctrl+F6 to exit CLI focus' label and 'Copy' and 'Paste' buttons. At the bottom left, there is a 'Top' button.