Experiment 1

Layer 2: Data Link Layer

"‥ we learn by doing…"

Names:

1. **Last:** Nagdev **First:** Rahul Shankar
2. **Last:** Nigam **First:** Amiraj
3. **Last:** Ashrit **First:** Anirudh

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

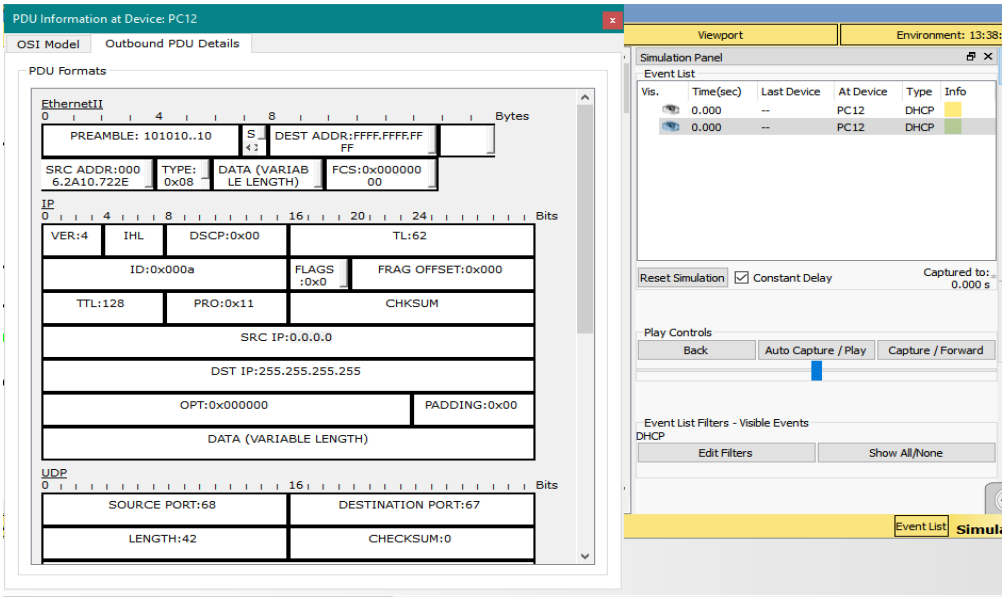
Proceed with Capture/Forward instance to answer the following questions:

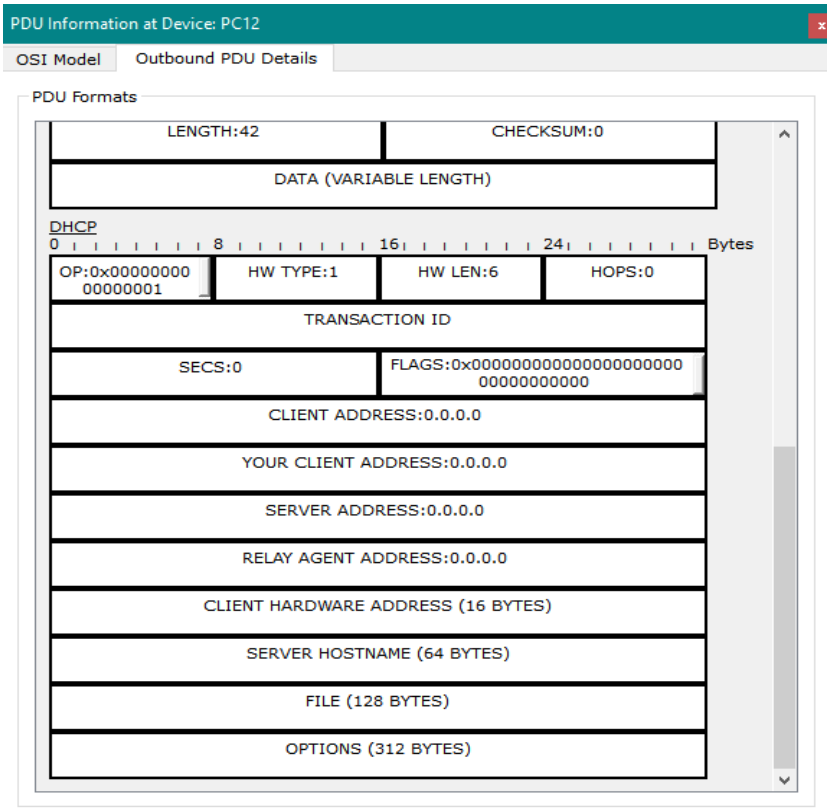
a. Enter the MAC address and the IP address of the source and destination of the outbound first message.

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.





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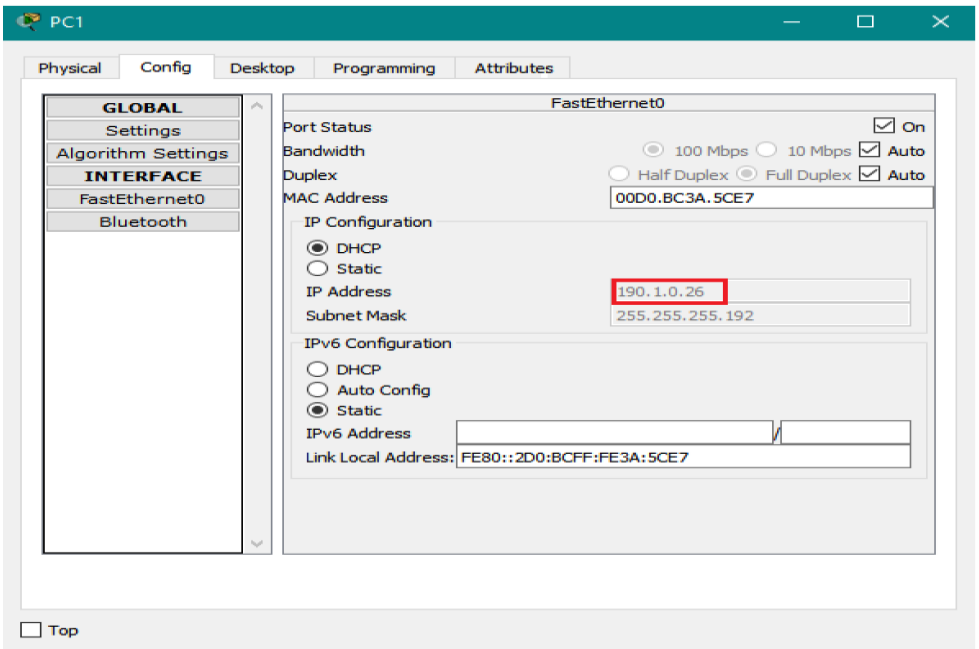
b. What is the IP address assigned for PC1?

IP address assigned to PC1 is 190.1.0.26



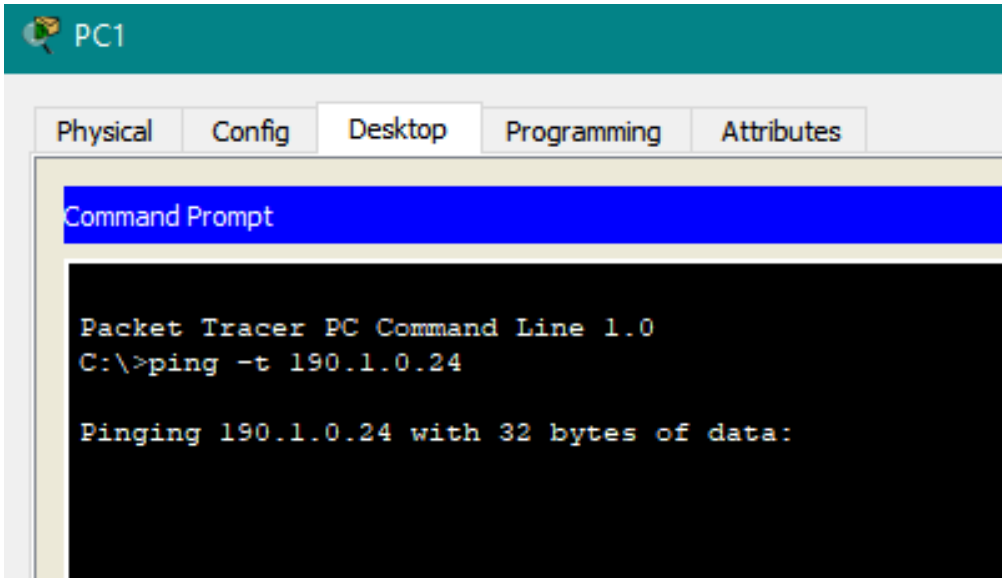
c. Why there were so many packets being dropped by other hosts in the LAN?

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.

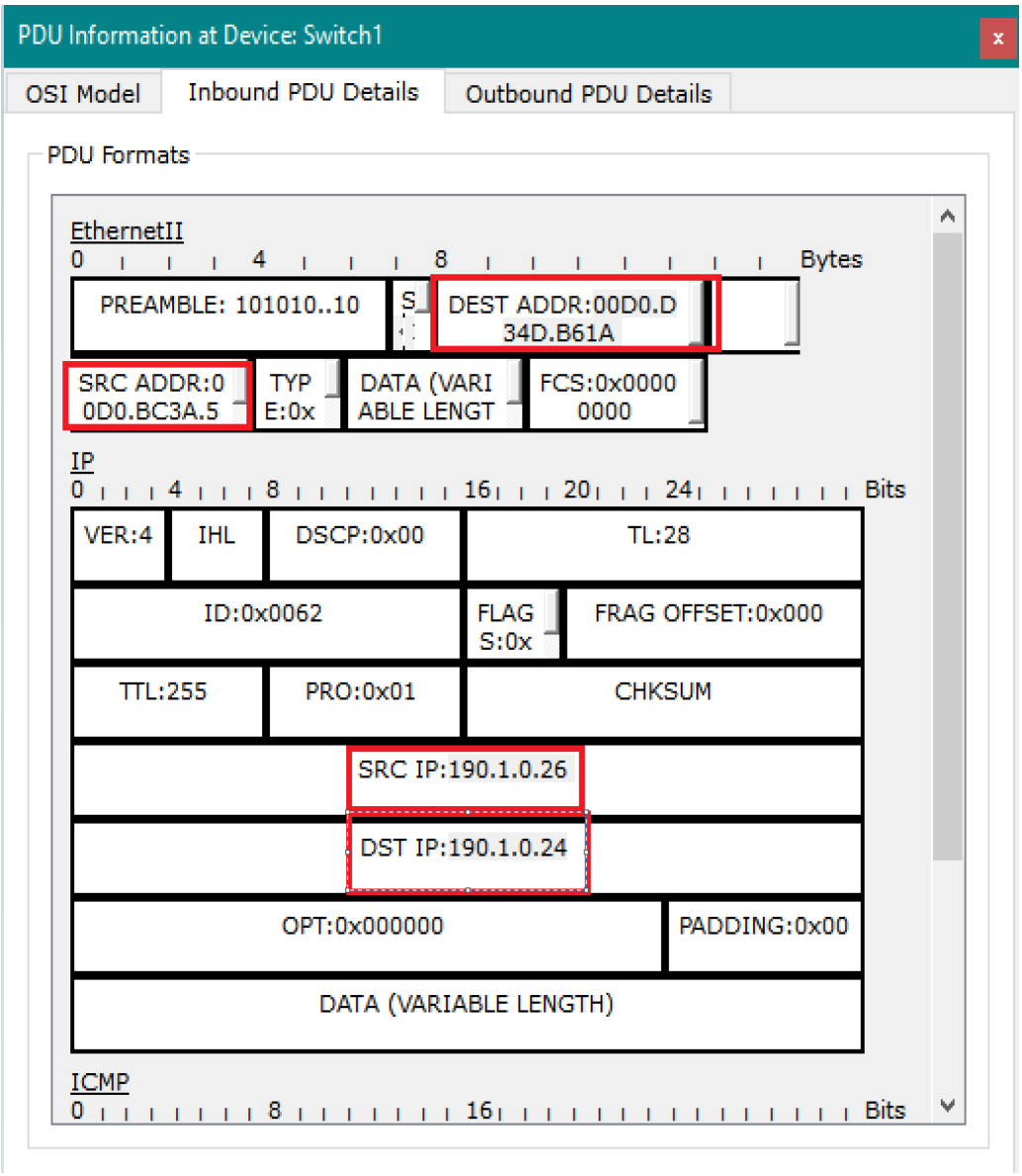
Step 7

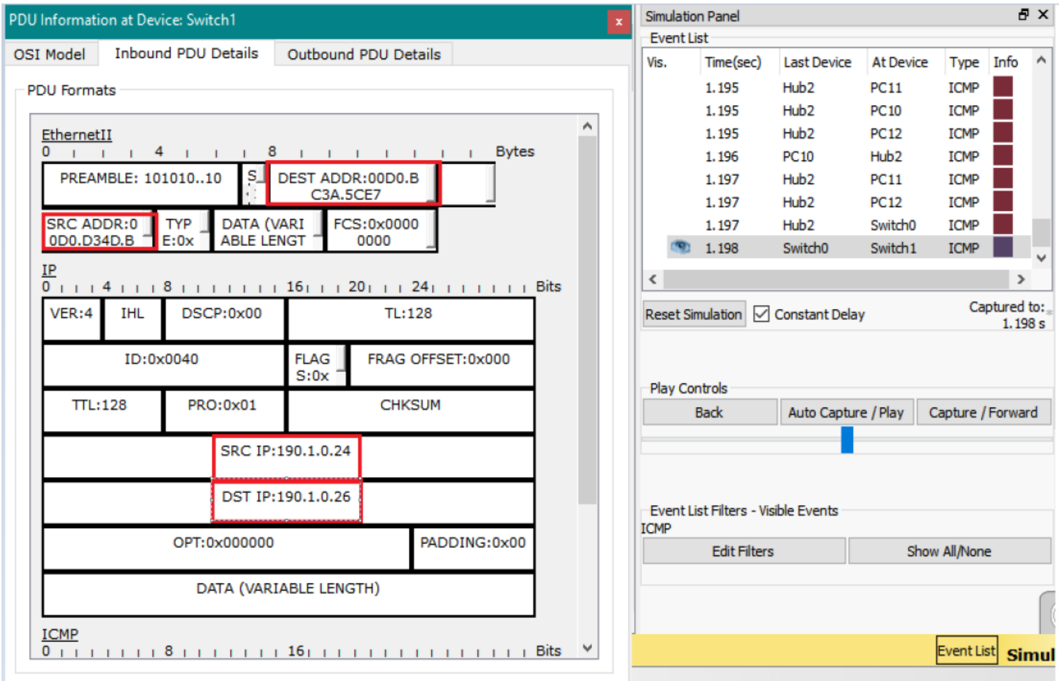
a. In the simulation mode set the *Event list* filter to ICMP only to reduce the number of messages exchanged , then enter the IP and MAC addresses of the source and destination of the 1st 7 messages (outbound and inbound) that are crossing the root-BRIDGE (Switch1)

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.



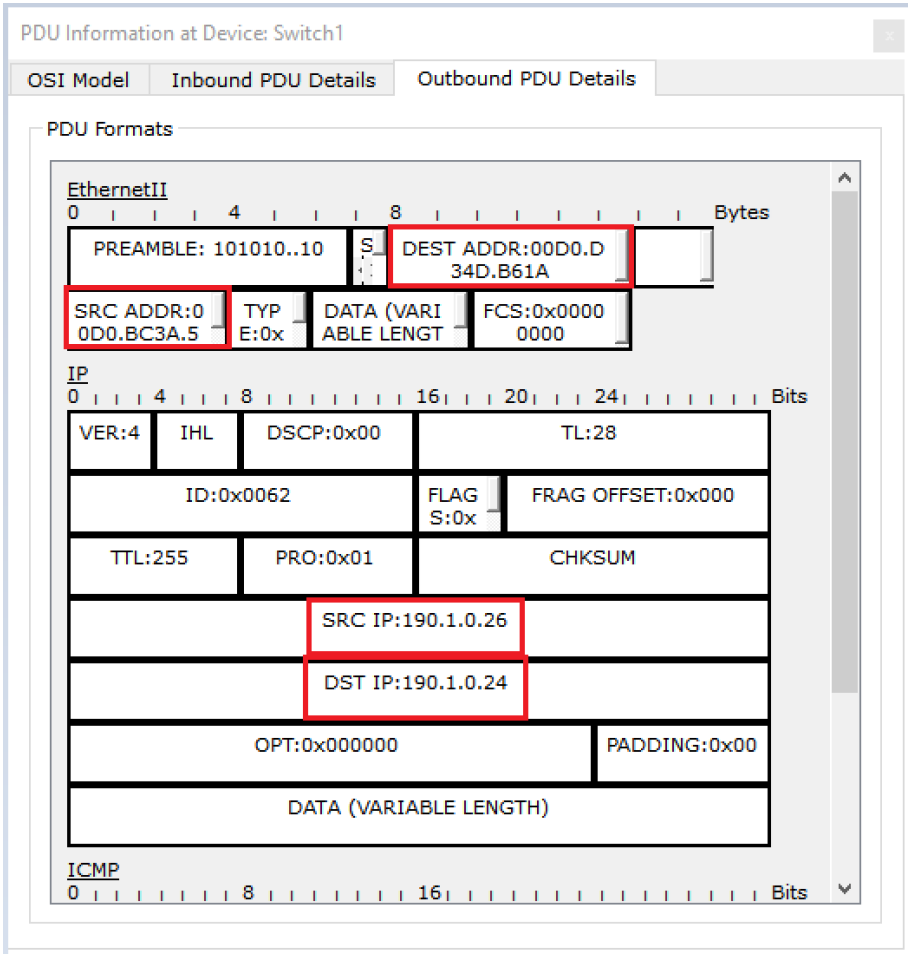
Inbound

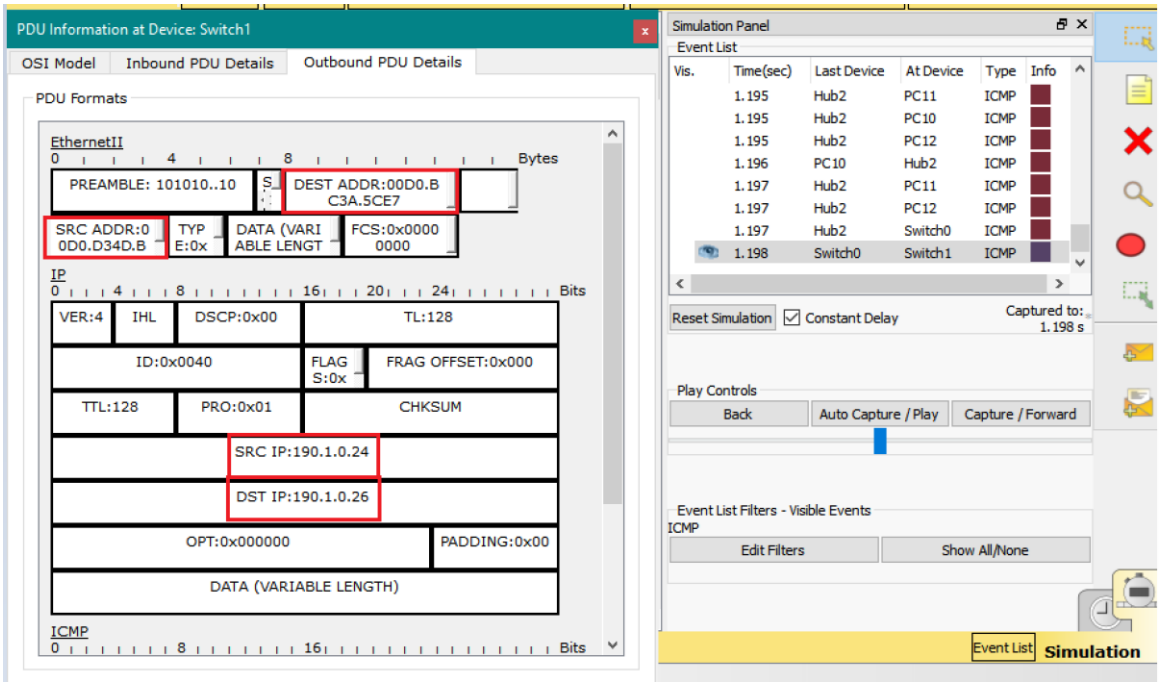

PDU Information at Device: Switch1
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
EthernetII
0
4
8
Bytes
PREAMBLE: 101010..10
S
DEST ADDR:00D0.D
34D.B61A
SRC ADDR:0
0D0.BC3A.5
TYP
E:0x
DATA (VARI
ABLE LENGT
FCS:0x0000
0000
IP
0
4
8
16
20
24
Bits
VER:4
IHL
DSCP:0x00
TL:28
ID:0x0062
FLAG
S:0x
FRAG OFFSET:0x000
TTL:255
PRO:0x01
CHKSUM
SRC IP:190.1.0.26
DST IP:190.1.0.24
OPT:0x000000
PADDING:0x00
DATA (VARIABLE LENGTH)
ICMP
0
8
16
Bits



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
S
DEST ADDR:00D0.D34D.B61A
SRC ADDR:00D0.BC3A.5
TYPE:0x
DATA (VARIABLE LENGT
FCS:0x0000 0000
IP
0 4 8 16 20 24 Bits
VER:4
IHL
DSCP:0x00
TL:28
ID:0x0062
FLAGS:0x
FRAG OFFSET:0x000
TTL:255
PRO:0x01
CHKSUM
SRC IP:190.1.0.26
DST IP:190.1.0.24
OPT:0x000000
PADDING:0x00
DATA (VARIABLE LENGTH)
ICMP
0 8 16 Bits


PDU Information at Device: Switch1
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
EthernetII
PREAMBLE: 101010..10
DEST ADDR:00D0.BC3A.5CE7
SRC ADDR:00D0.D34D.B
DATA (VARIABLE LENGT
FCS:0x0000 0000
IP
VER:4
IHL
DSCP:0x00
TL:128
ID:0x0040
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
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

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

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:

Pkt	*MAC address*	*IP address*
source	00D0.BC3A.5CE7	190.1.0.26
destination	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:

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

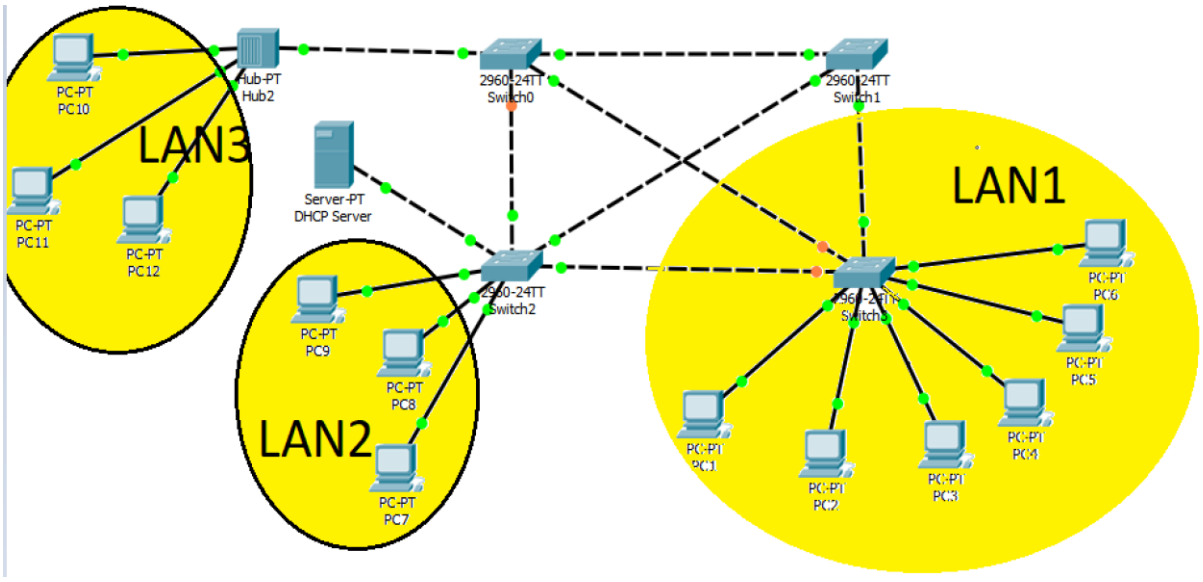
Observation: The Source and Destination IP as well as MAC address changes when the ICMP packets are being exchanged between PC1 and PC10.

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:

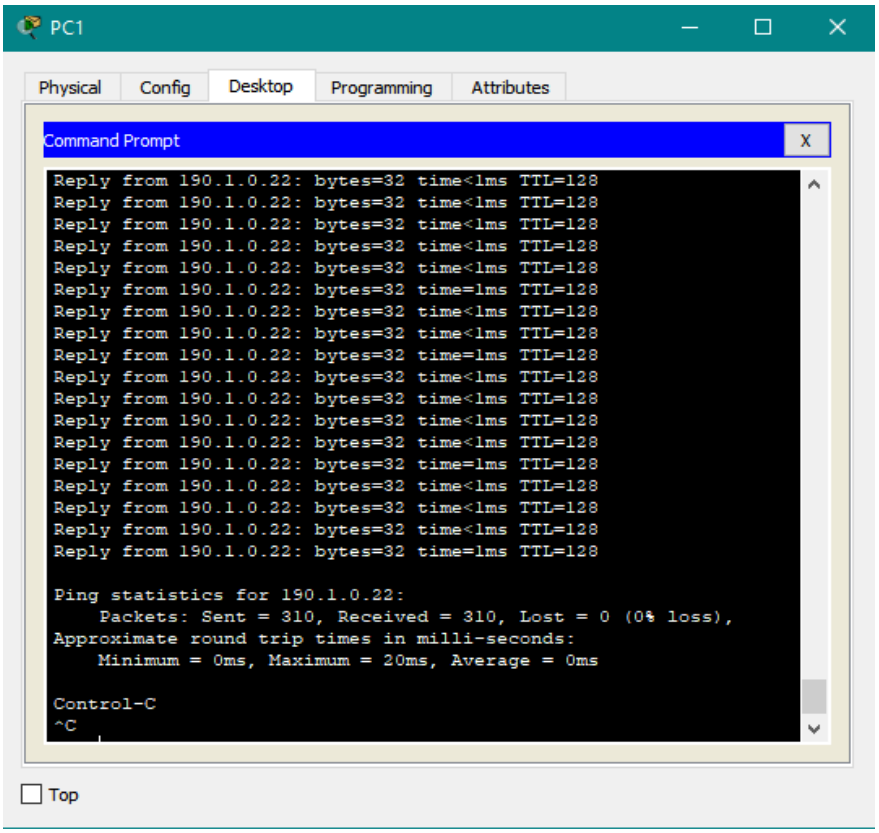


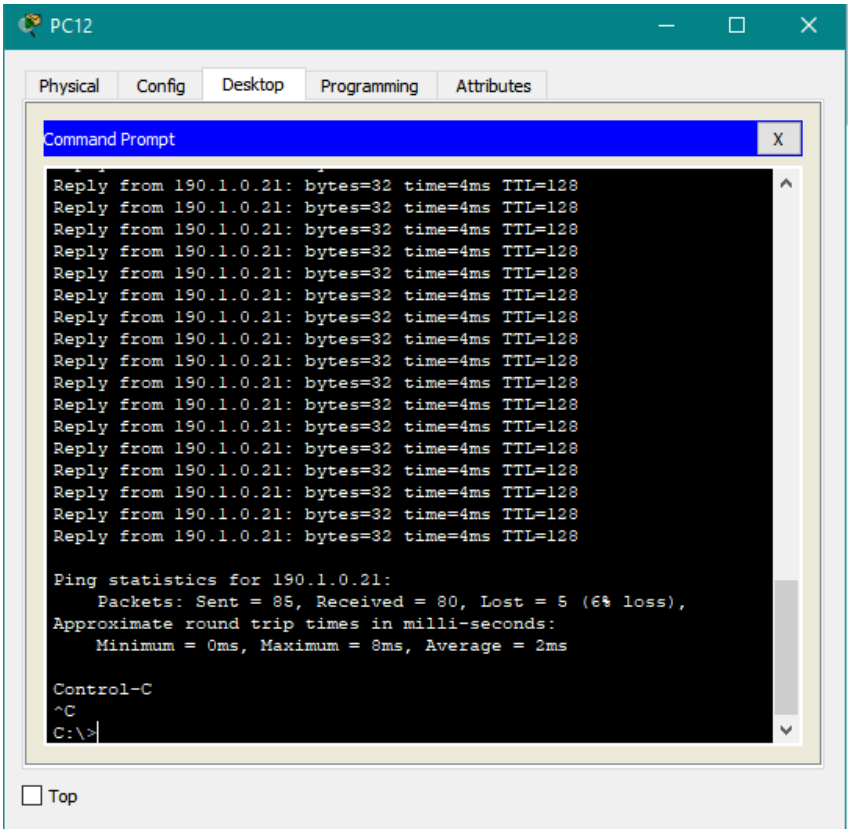
Percentage Loss:

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.


PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time=1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time=1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time=1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time<1ms TTL=128
Reply from 190.1.0.22: bytes=32 time=1ms TTL=128
Ping statistics for 190.1.0.22:
Packets: Sent = 310, Received = 310, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 20ms, Average = 0ms
Control-C
^C
Top


PC12
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Reply from 190.1.0.21: bytes=32 time=4ms TTL=128
Ping statistics for 190.1.0.21:
Packets: Sent = 85, Received = 80, Lost = 5 (6% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 8ms, Average = 2ms
Control-C
^C
C:\>
Top

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:

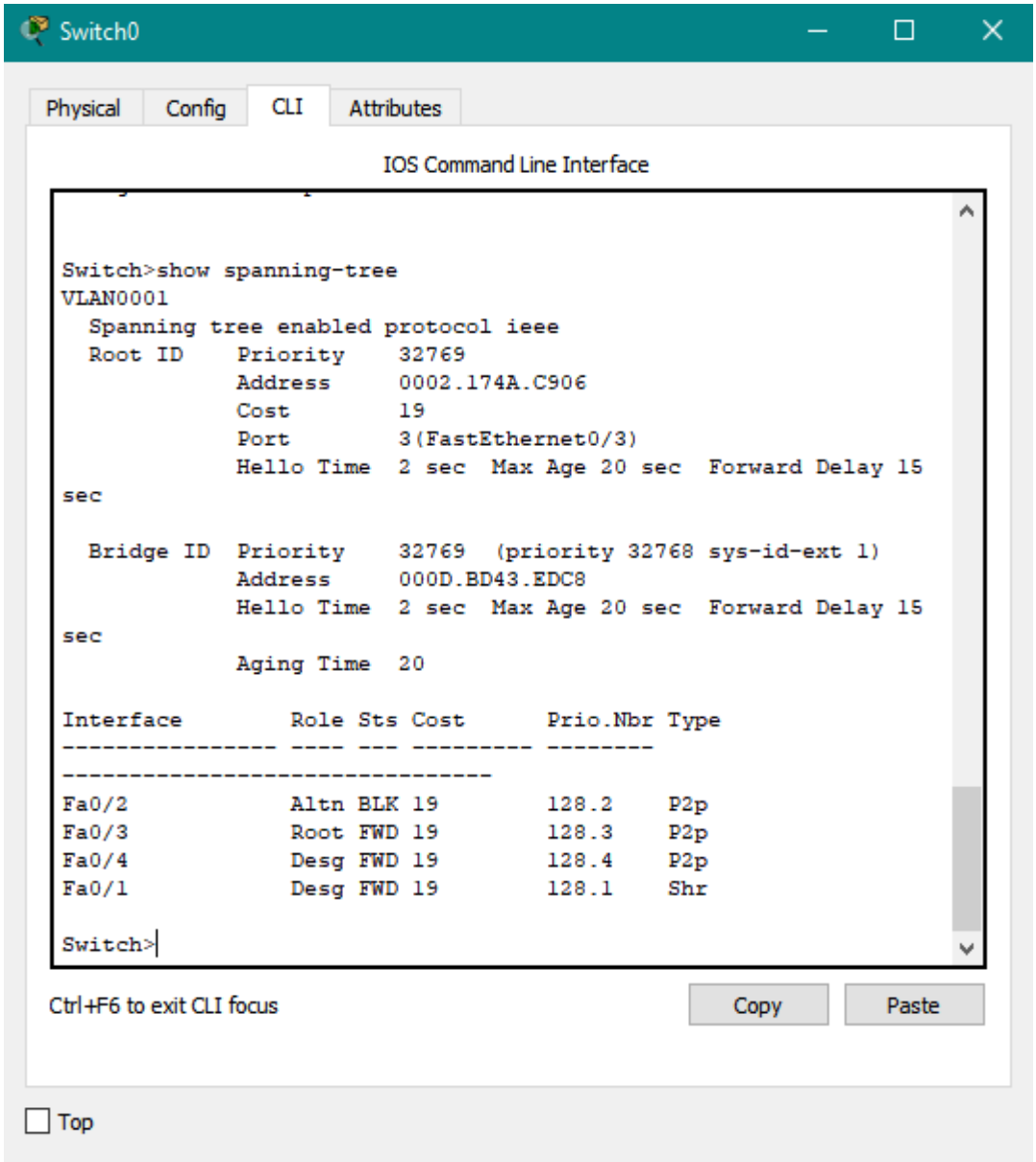
https://youtu.be/t_shpw2_oeY

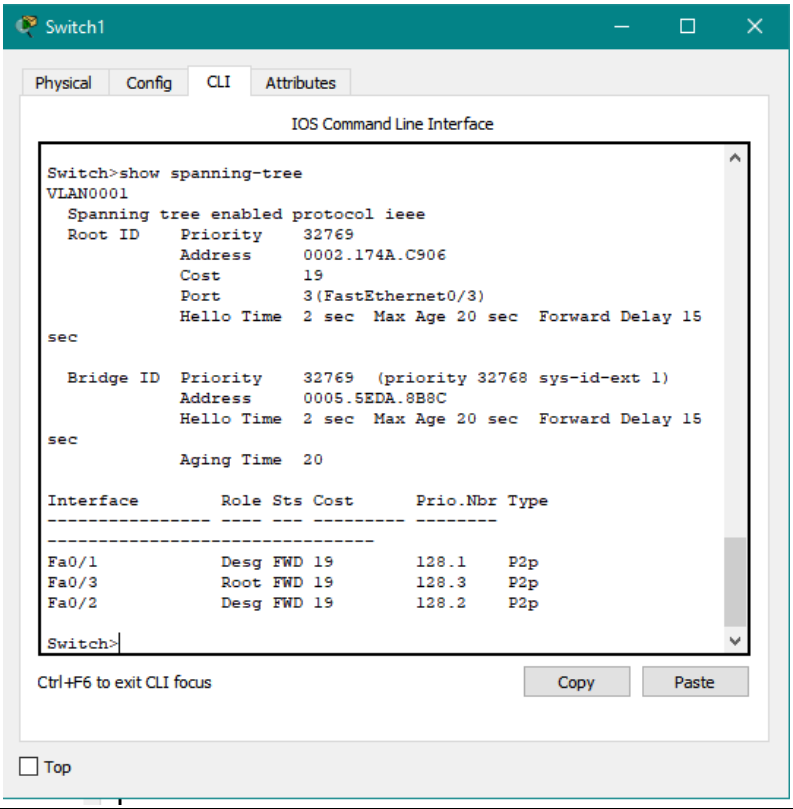
PART III

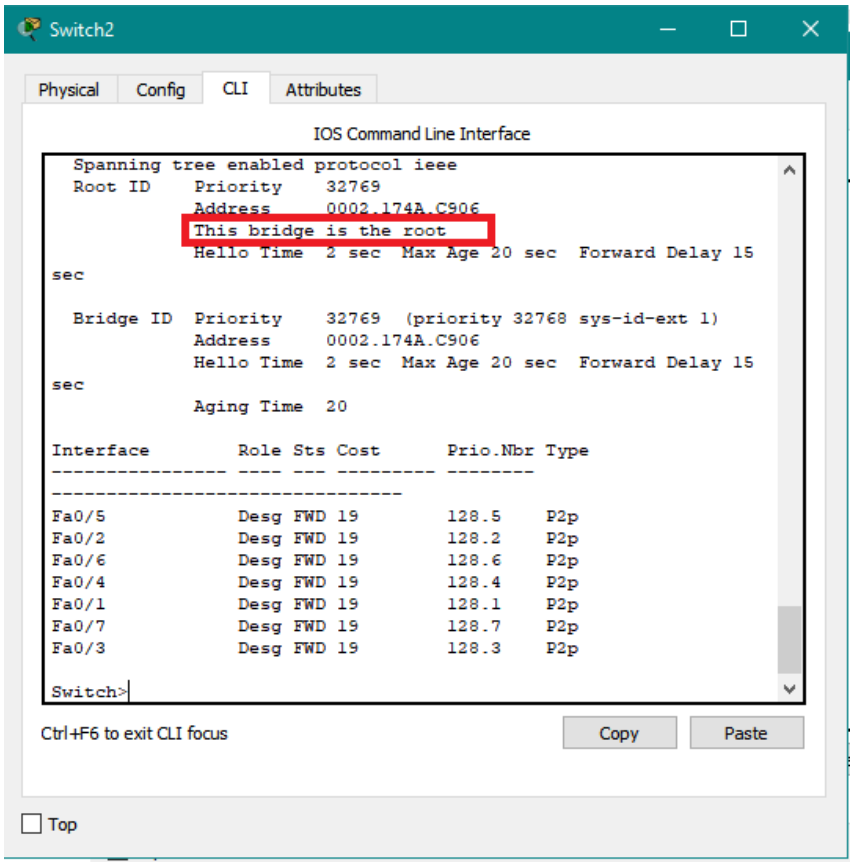
Step 2

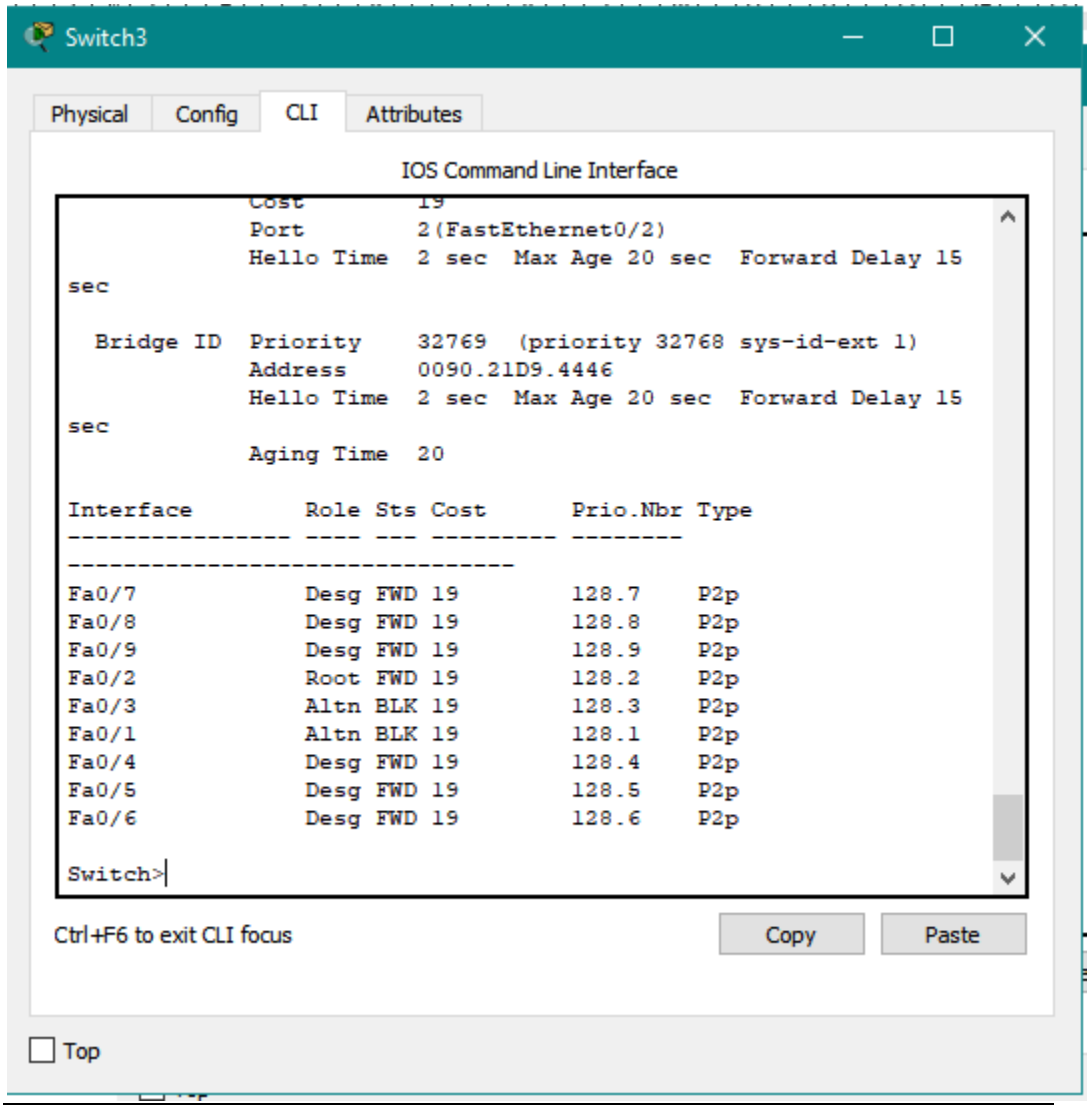
a. Use Step1 to determine the root-bridge and its MAC address in your network.

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




Switch1
Physical
Config
CLI
Attributes
IOS Command Line Interface
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 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
Fa0/1 Desg FWD 19 128.1 P2p
Fa0/3 Root FWD 19 128.3 P2p
Fa0/2 Desg FWD 19 128.2 P2p
Switch>
Ctrl+F6 to exit CLI focus
Copy
Paste
Top


Switch2
Physical
Config
CLI
Attributes
IOS Command Line Interface
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0002.174A.C906
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15
sec
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0002.174A.C906
Hello Time 2 sec Max Age 20 sec Forward Delay 15
sec
Aging Time 20
Interface Role Sts Cost Prio.Nbr Type
Fa0/5 Desg FWD 19 128.5 P2p
Fa0/2 Desg FWD 19 128.2 P2p
Fa0/6 Desg FWD 19 128.6 P2p
Fa0/4 Desg FWD 19 128.4 P2p
Fa0/1 Desg FWD 19 128.1 P2p
Fa0/7 Desg FWD 19 128.7 P2p
Fa0/3 Desg FWD 19 128.3 P2p
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:

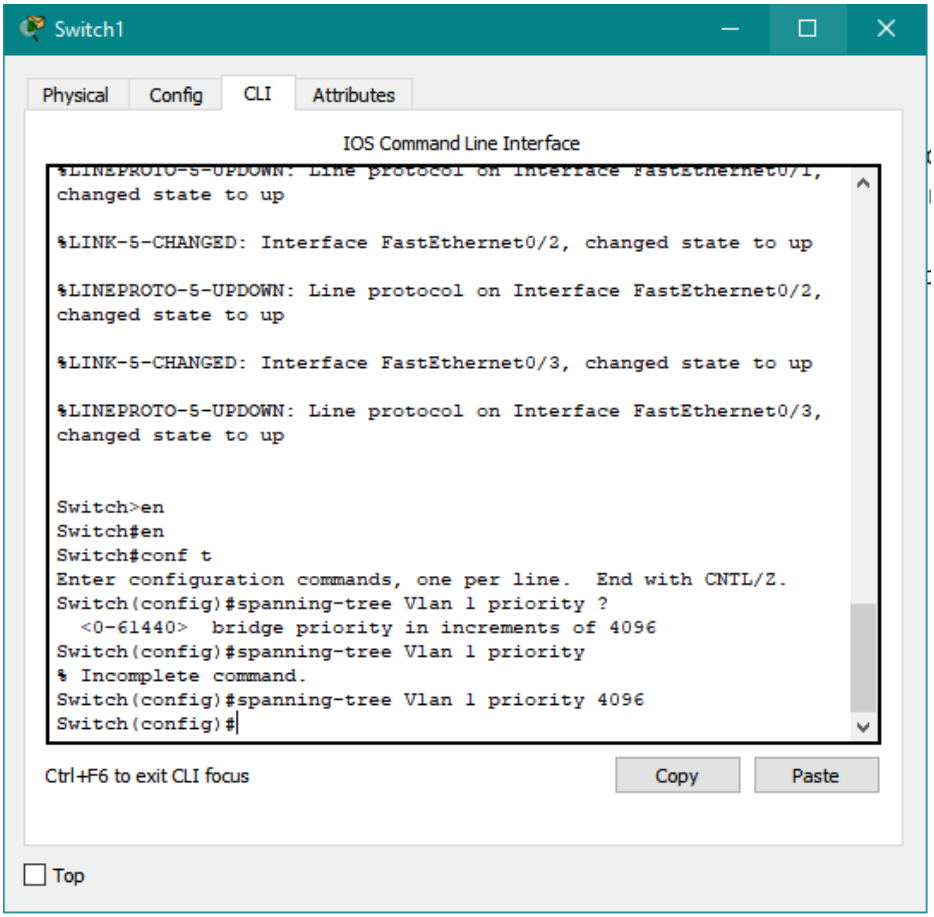
```
Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
           Address     0090.21D9.4446
```

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.



Following is the result after execution of the commands