DATE : 20-NOVEMBER-2024

LAB- 5

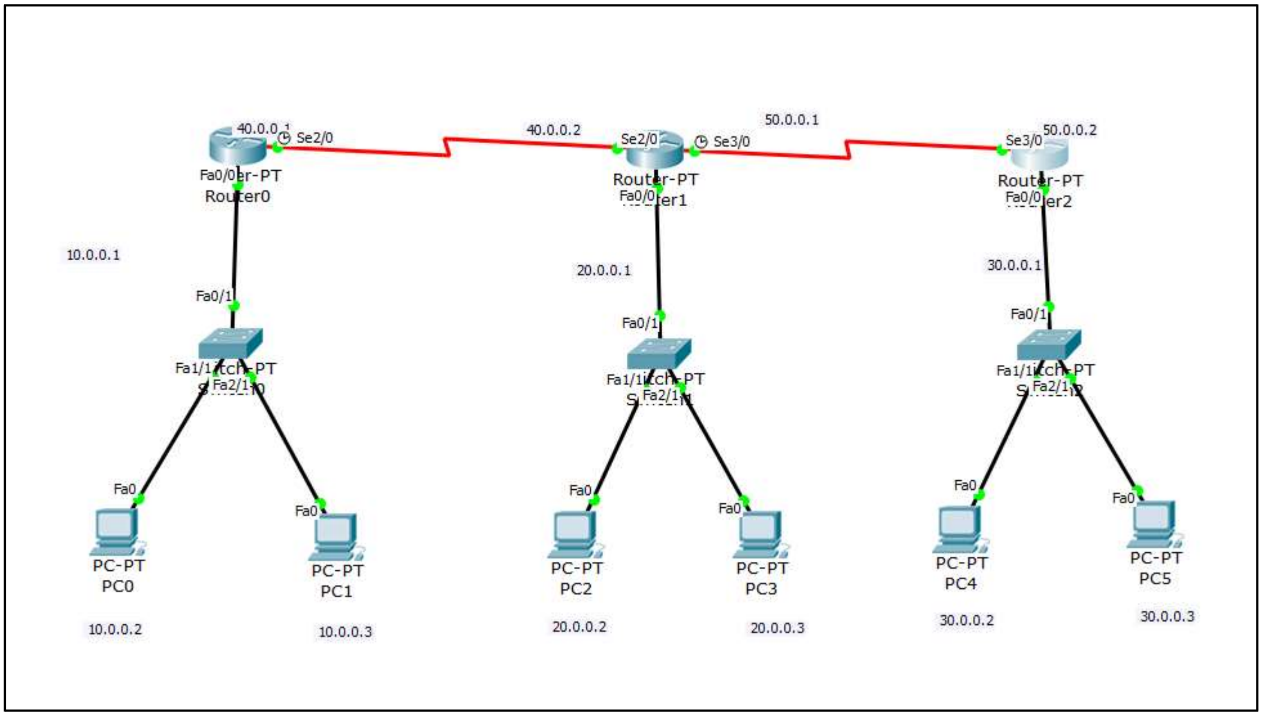
Question:

Demonstrate the TTL/ Life of a Packet

Aim:

To Demonstrate the TTL/ Life of a Packet.

Topology:


40.0.0.1
Se2/0
Fa0/0
Router-PT
Router0
10.0.0.1
Fa0/1
Fa1/1
Switch-PT
Fa2/1
Fa0
PC-PT
PC0
10.0.0.2
Fa0
PC-PT
PC1
10.0.0.3
40.0.0.2
Se2/0
Se3/0
50.0.0.1
Router-PT
Fa0/0
Router1
20.0.0.1
Fa0/1
Fa1/1
Switch-PT
Fa2/1
Fa0
PC-PT
PC2
20.0.0.2
Fa0
PC-PT
PC3
20.0.0.3
Se3/0
50.0.0.2
Router-PT
Fa0/0
Router2
30.0.0.1
Fa0/1
Fa1/1
Switch-PT
Fa2/1
Fa0
PC-PT
PC4
30.0.0.2
Fa0
PC-PT
PC5
30.0.0.3

Topology Description:

4. **Devices Involved**:
    - **3 Routers**:
        - Router0
        - Router1
        - Router2
    - **3 Switches**:

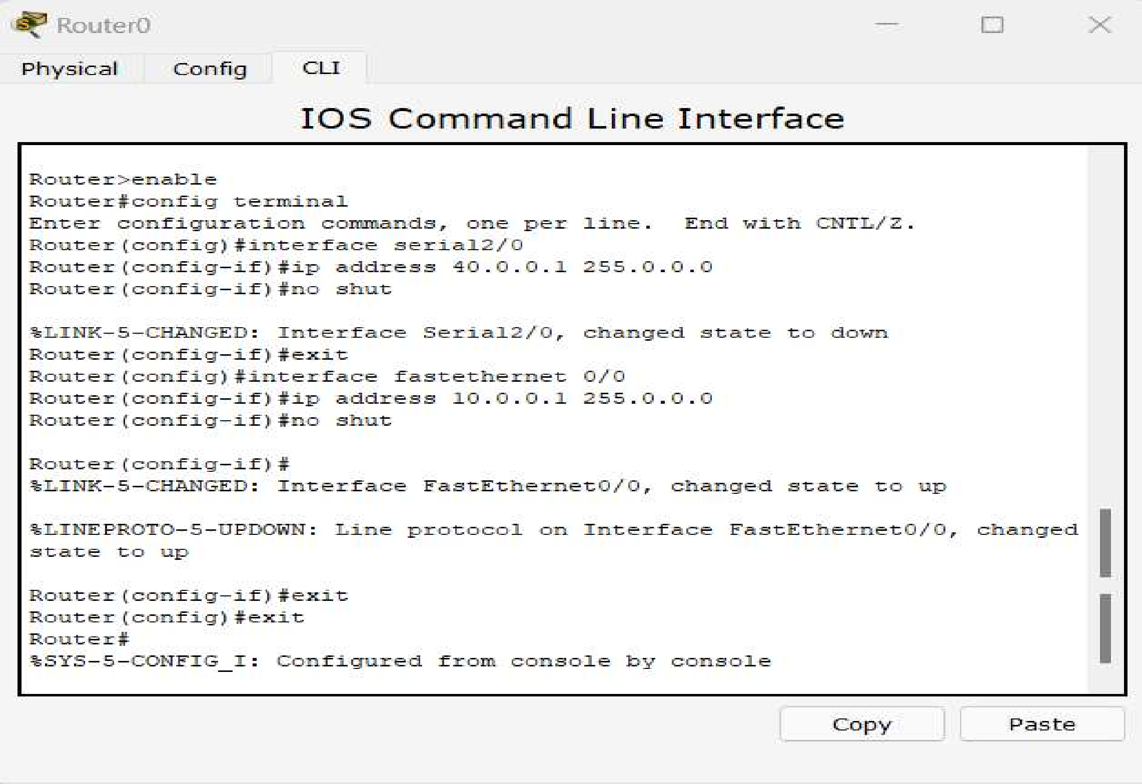
        - Switch connected to Router0
        - Switch connected to Router1
        - Switch connected to Router2
    - **6 PCs**:
        - PC0, PC1 connected to Router 0 via a switch
        - PC2, PC3 connected to Router 1 via a switch
        - PC4, PC5 connected to Router 2 via a switch

5. **Connections**:
    - Router0 is connected to Router 1 via Serial (Se2/0) interface.
    - Router1 is connected to Router 2 via Serial (Se3/0) interface.
    - Each router connects to a switch, which then connects to two PCs.
6. **IP Address Schema**:
    - **Router0 LAN**: 10.0.0.0/24
        - Router0: 10.0.0.1
        - PC0: 10.0.0.2
        - PC1: 10.0.0.3
    - **Router1 LAN**: 20.0.0.0/24
        - Router1: 20.0.0.1
        - PC2: 20.0.0.2
        - PC3: 20.0.0.3
    - **Router2 LAN**: 30.0.0.0/24
        - Router2: 30.0.0.1
        - PC4: 30.0.0.2
        - PC5: 30.0.0.3
    - Serial links:
        - Between Router0 and Router1: 40.0.0.0/30
        - Between Router1 and Router2: 50.0.0.0/30

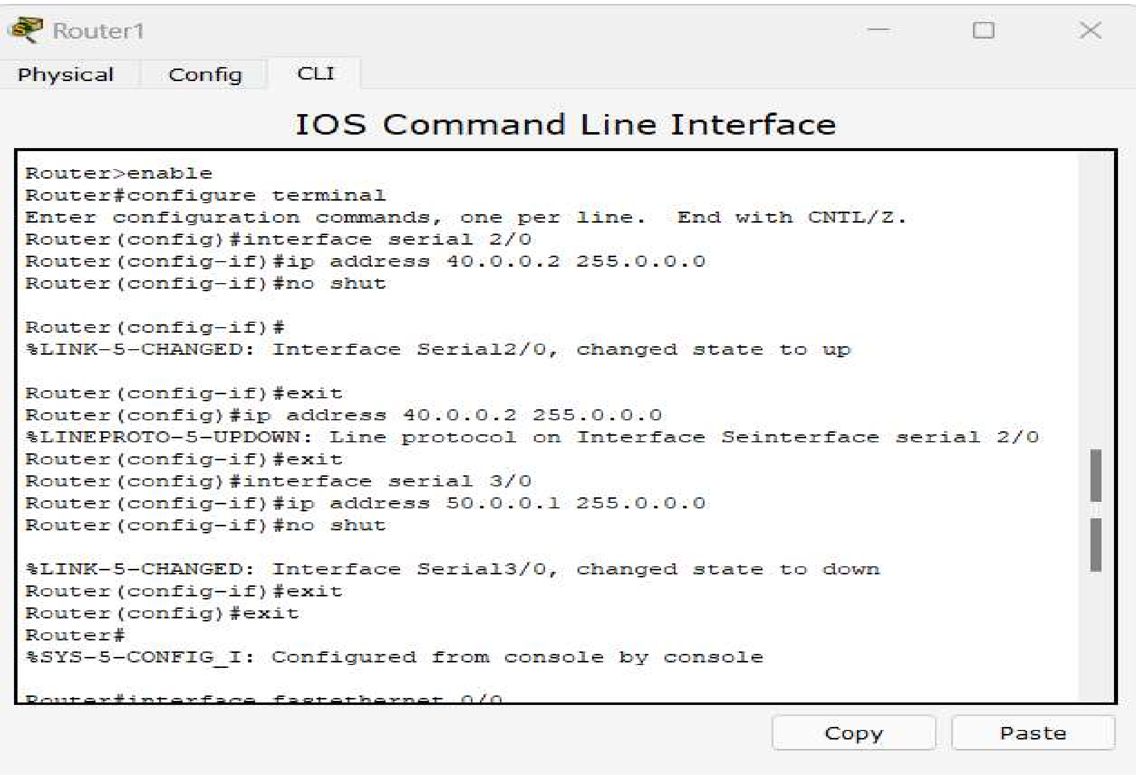
Procedure to Configure the Network:

Step 1: Configure Router Interfaces

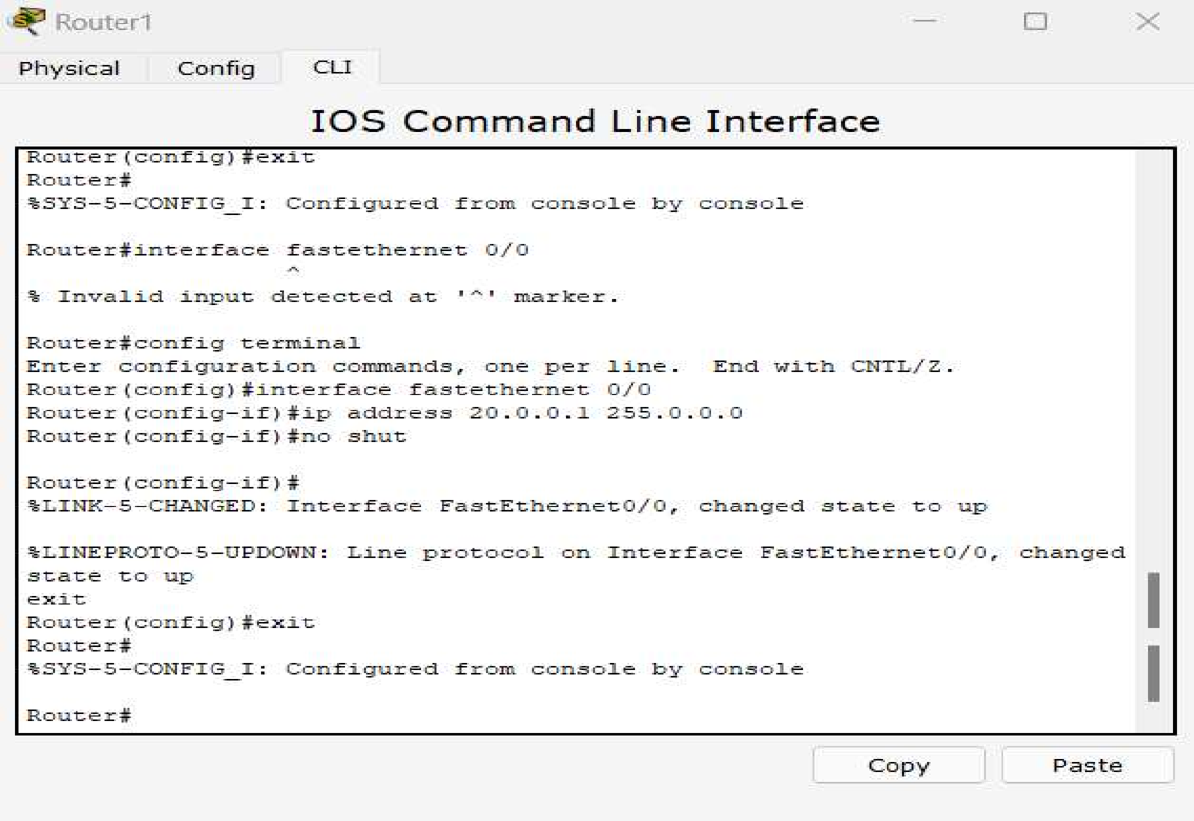
3. Access each router using CLI (Command Line Interface).
4. Assign IP addresses to FastEthernet and Serial interfaces:



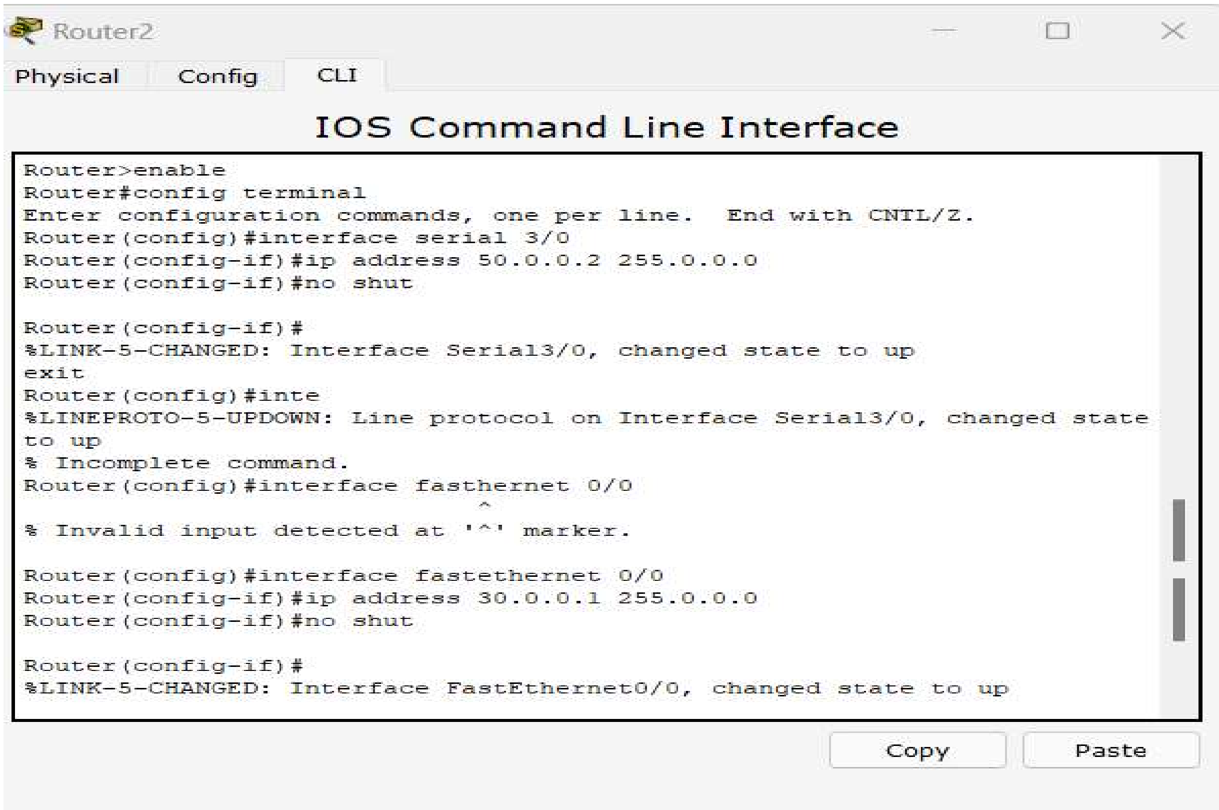
```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial2/0
Router(config-if)#ip address 40.0.0.1 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```



```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 40.0.0.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

Router(config-if)#exit
Router(config)#ip address 40.0.0.2 255.0.0.0
%LINEPROTO-5-UPDOWN: Line protocol on Interface Seinterface serial 2/0
Router(config-if)#exit
Router(config)#interface serial 3/0
Router(config-if)#ip address 50.0.0.1 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#interface fastethernet 0/0
```



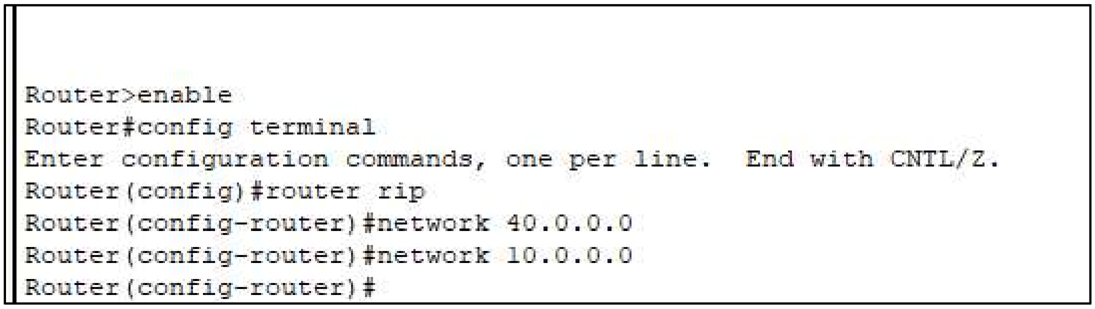
```
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#interface fastethernet 0/0
                   ^
% Invalid input detected at '^' marker.

Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up
exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
```



```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 3/0
Router(config-if)#ip address 50.0.0.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
exit
Router(config)#inte
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state
to up
% Incomplete command.
Router(config)#interface fasthernet 0/0
                              ^
% Invalid input detected at '^' marker.

Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
```

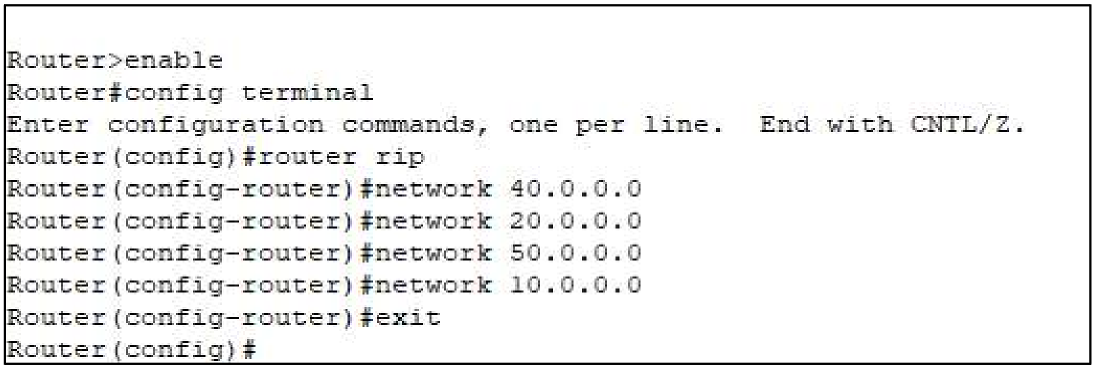
Step 2: Configure Routing:

Router 0:



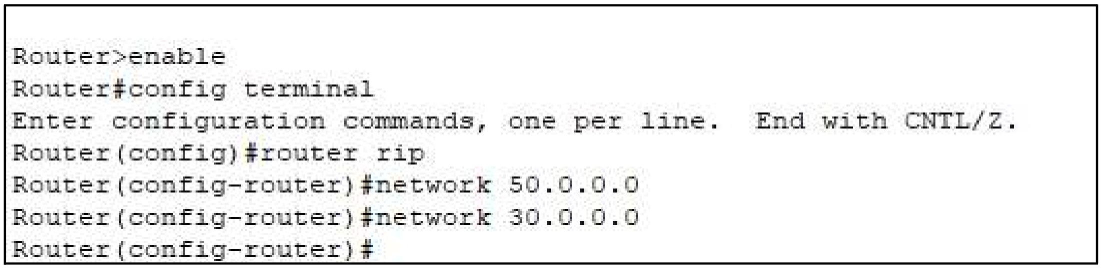
```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 40.0.0.0
Router(config-router)#network 10.0.0.0
Router(config-router)#
```

Router 1:



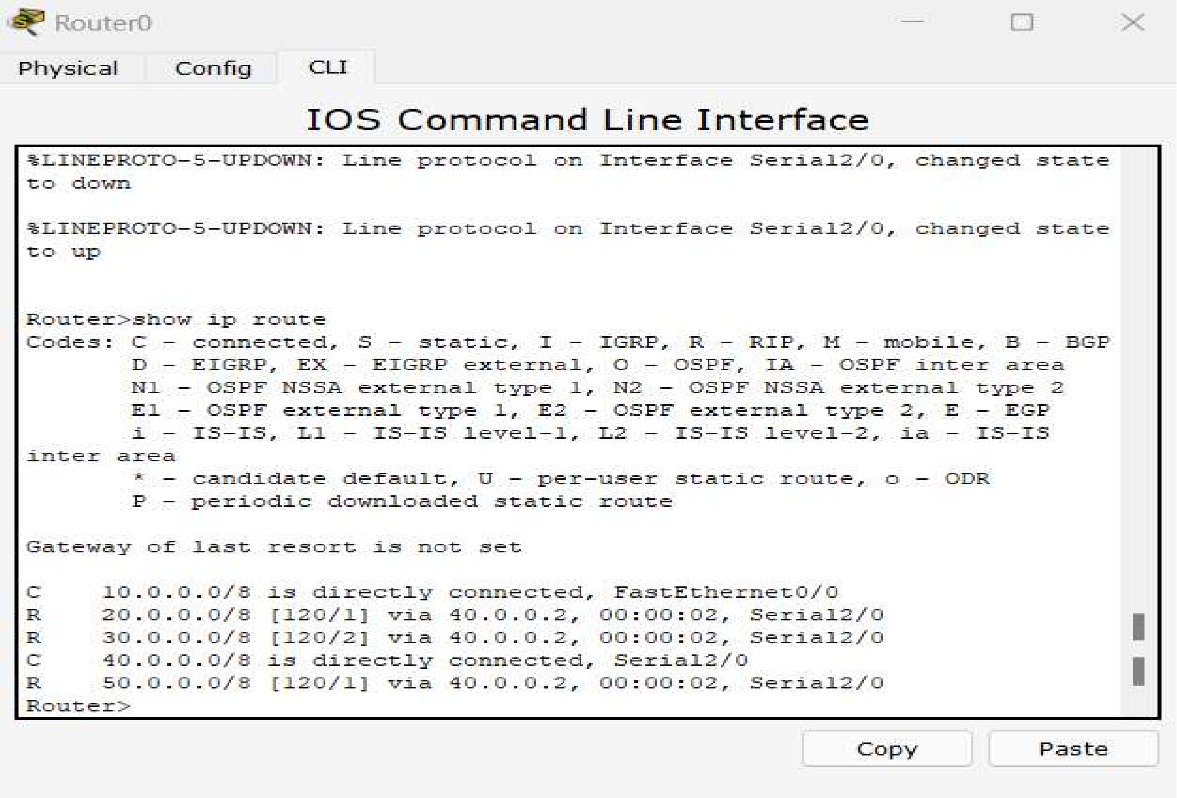
```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 40.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#network 10.0.0.0
Router(config-router)#exit
Router(config)#
```

Router 2:

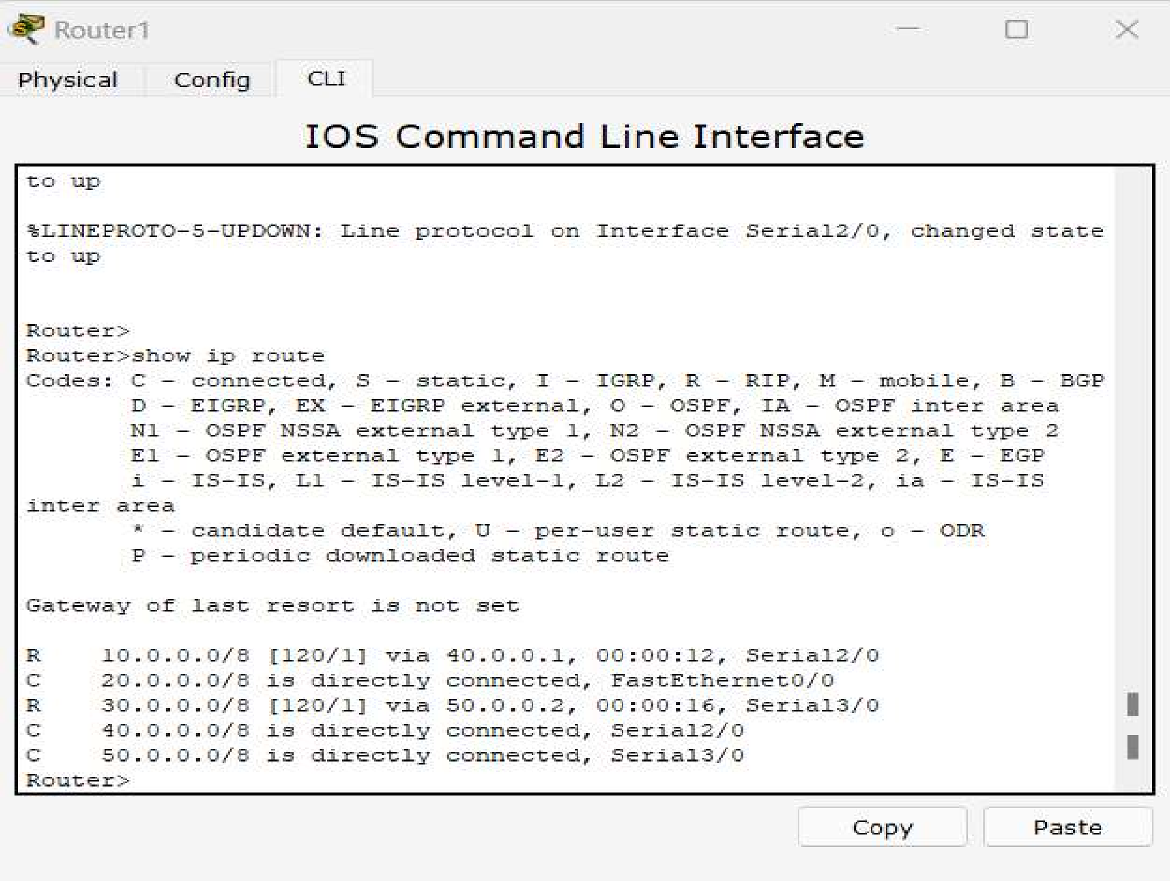


```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 50.0.0.0
Router(config-router)#network 30.0.0.0
Router(config-router)#
```

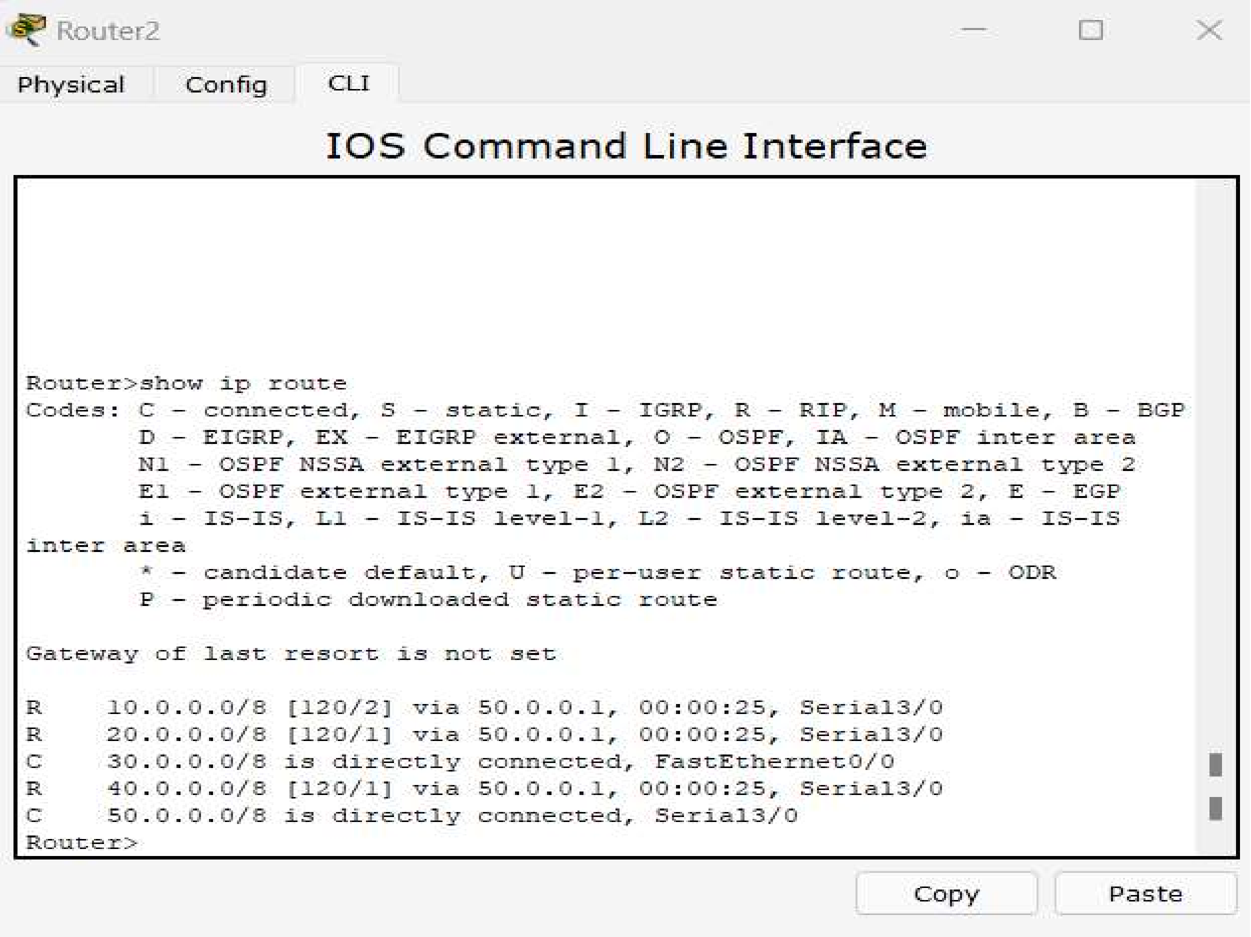
Step 3: Routing



```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state
to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state
to up


Router>show ip route
Codes: C - connected, S - static, I - IGRP, 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

C    10.0.0.0/8 is directly connected, FastEthernet0/0
R    20.0.0.0/8 [120/1] via 40.0.0.2, 00:00:02, Serial2/0
R    30.0.0.0/8 [120/2] via 40.0.0.2, 00:00:02, Serial2/0
C    40.0.0.0/8 is directly connected, Serial2/0
R    50.0.0.0/8 [120/1] via 40.0.0.2, 00:00:02, Serial2/0
Router>
```



```
to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state
to up


Router>
Router>show ip route
Codes: C - connected, S - static, I - IGRP, 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

R    10.0.0.0/8 [120/1] via 40.0.0.1, 00:00:12, Serial2/0
C    20.0.0.0/8 is directly connected, FastEthernet0/0
R    30.0.0.0/8 [120/1] via 50.0.0.2, 00:00:16, Serial3/0
C    40.0.0.0/8 is directly connected, Serial2/0
C    50.0.0.0/8 is directly connected, Serial3/0
Router>
```



```
Router>show ip route
Codes: C - connected, S - static, I - IGRP, 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

R    10.0.0.0/8 [120/2] via 50.0.0.1, 00:00:25, Serial3/0
R    20.0.0.0/8 [120/1] via 50.0.0.1, 00:00:25, Serial3/0
C    30.0.0.0/8 is directly connected, FastEthernet0/0
R    40.0.0.0/8 [120/1] via 50.0.0.1, 00:00:25, Serial3/0
C    50.0.0.0/8 is directly connected, Serial3/0
Router>
```

Demonstration of TTL (Time to Live) or Packet Lifetime

Overview

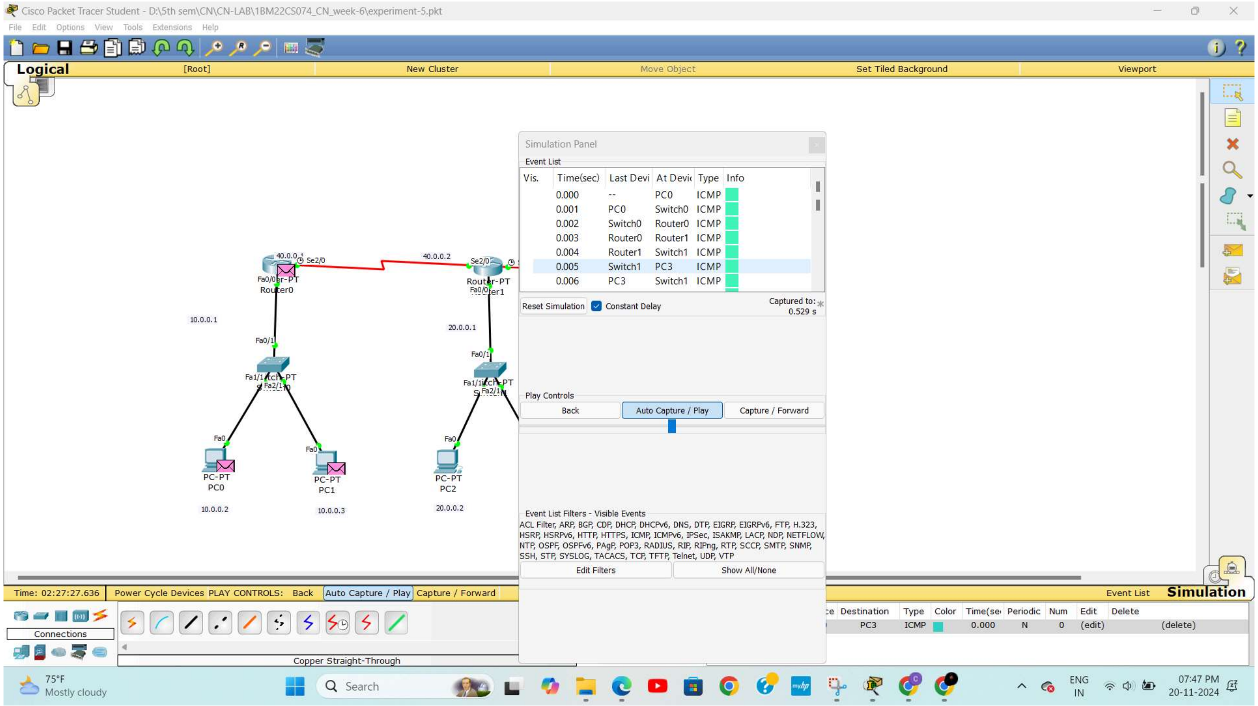
- **TTL (Time to Live):** It is a field in the IP header of a packet that limits the lifespan of a packet in the network. It is measured in hops. Every time the packet crosses a router, the TTL value is decremented by 1. When the TTL reaches 0, the packet is discarded, and an error message (ICMP "Time Exceeded") is sent back to the source.

Purpose of TTL Demonstration

- To observe the reduction of TTL as the packet traverses routers.
- To demonstrate how the TTL value ensures packets don’t circulate indefinitely in the network.

Topology Analysis

- **Source Device:** A PC in one network (e.g., PC0 in the 10.0.0.0/24 subnet).
- **Destination Device:** A PC in another network (e.g., PC4 in the 30.0.0.0/24 subnet).
- **Intermediate Routers:** The packet crosses Router0, Router1, and Router


Cisco Packet Tracer Student - D:\5th sem\CN\CN-LAB\1BM22CS074_CN_week-6\experiment-5.pkt
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
40.0.0.1
Se2/0
40.0.0.2
Se2/0
Router-PT
Router0
Router1
10.0.0.1
20.0.0.1
Fa0/0
Fa0/1
Fa1/1
Fa2/1
Switch-PT
Fa0
PC-PT
PC0
PC1
PC2
10.0.0.2
10.0.0.3
20.0.0.2
Simulation Panel
Event List
Reset Simulation
Play Controls
Back
Auto Capture / Play
Capture / Forward
Event List Filters - Visible Events
Edit Filters
Show All/None
Time: 02:27:27.636
Power Cycle Devices
PLAY CONTROLS:
Back
Auto Capture / Play
Capture / Forward
Event List
Simulation
Connections
Copper Straight-Through
75°F
Mostly cloudy
Search
ENG
IN
07:47 PM
20-11-2024

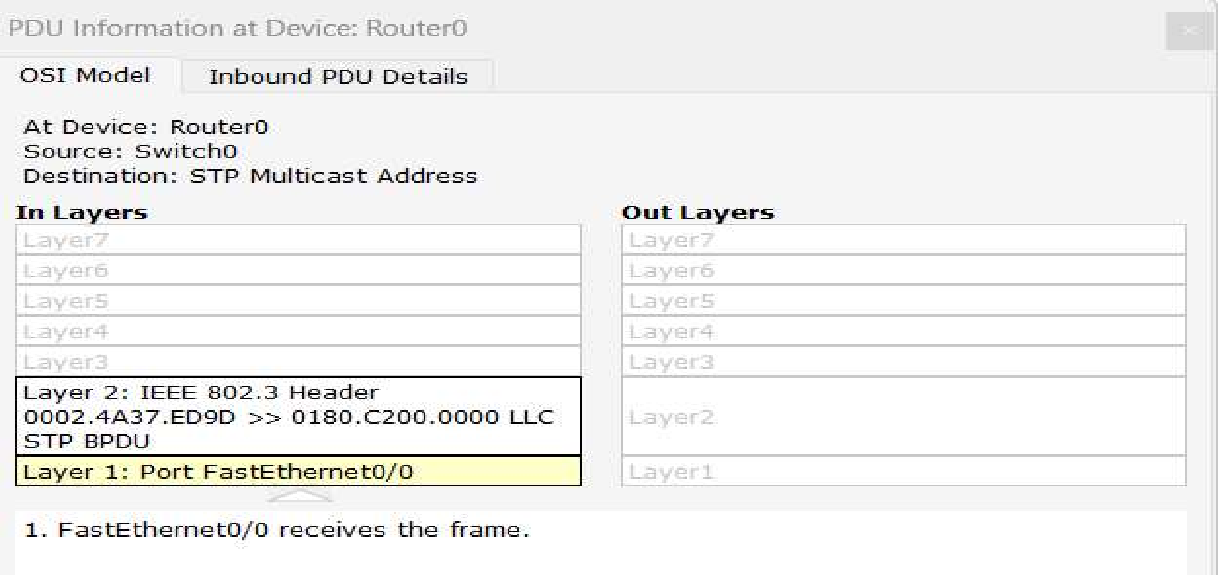
Vis.	Time(sec)	Last Devi	At Devi	Type	Info
	0.000	--	PC0	ICMP	🟩
	0.001	PC0	Switch0	ICMP	🟩
	0.002	Switch0	Router0	ICMP	🟩
	0.003	Router0	Router1	ICMP	🟩
	0.004	Router1	Switch1	ICMP	🟩
	0.005	Switch1	PC3	ICMP	🟩
	0.006	PC3	Switch1	ICMP	🟩

☑ Constant Delay

Captured to: 0.529 s

Event List Filters - Visible Events
ACL Filter, ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTP, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, LACP, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, VTP

ce	Destination	Type	Color	Time(se	Periodic	Num	Edit	Delete
	PC3	ICMP	🟦	0.000	N	0	(edit)	(delete)



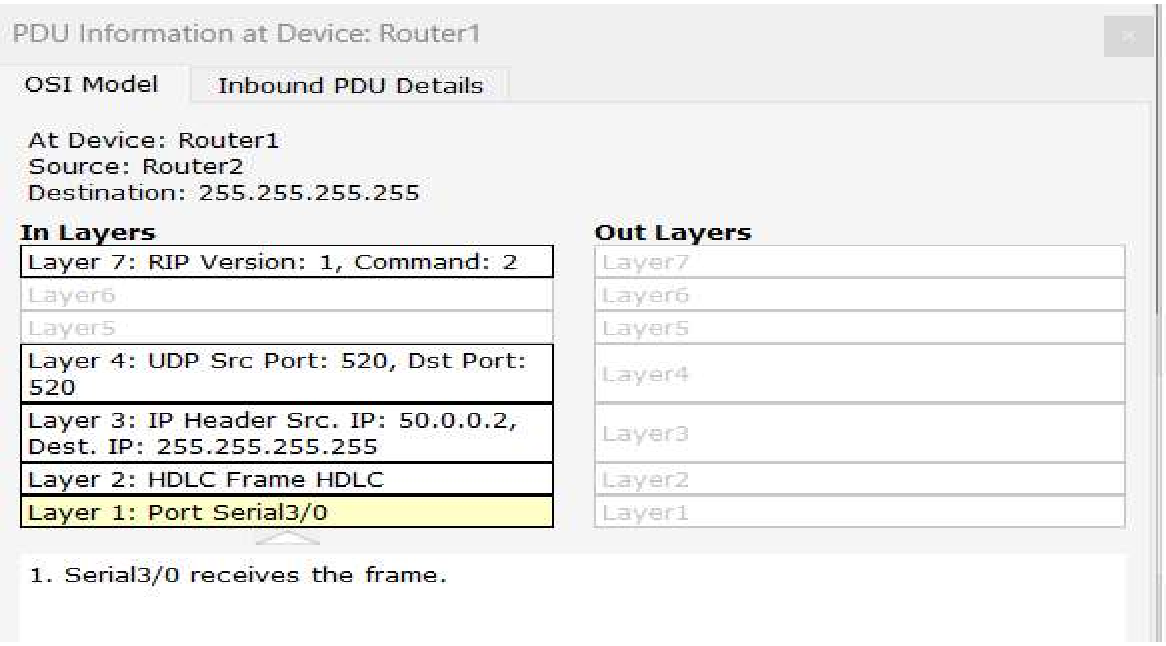
PDU Information at Device: Router0

OSI Model | Inbound PDU Details

At Device: Router0
Source: Switch0
Destination: STP Multicast Address

In Layers	Out Layers
Layer7	Layer7
Layer6	Layer6
Layer5	Layer5
Layer4	Layer4
Layer3	Layer3
Layer 2: IEEE 802.3 Header 0002.4A37.ED9D >> 0180.C200.0000 LLC STP BPDU	Layer2
Layer 1: Port FastEthernet0/0	Layer1

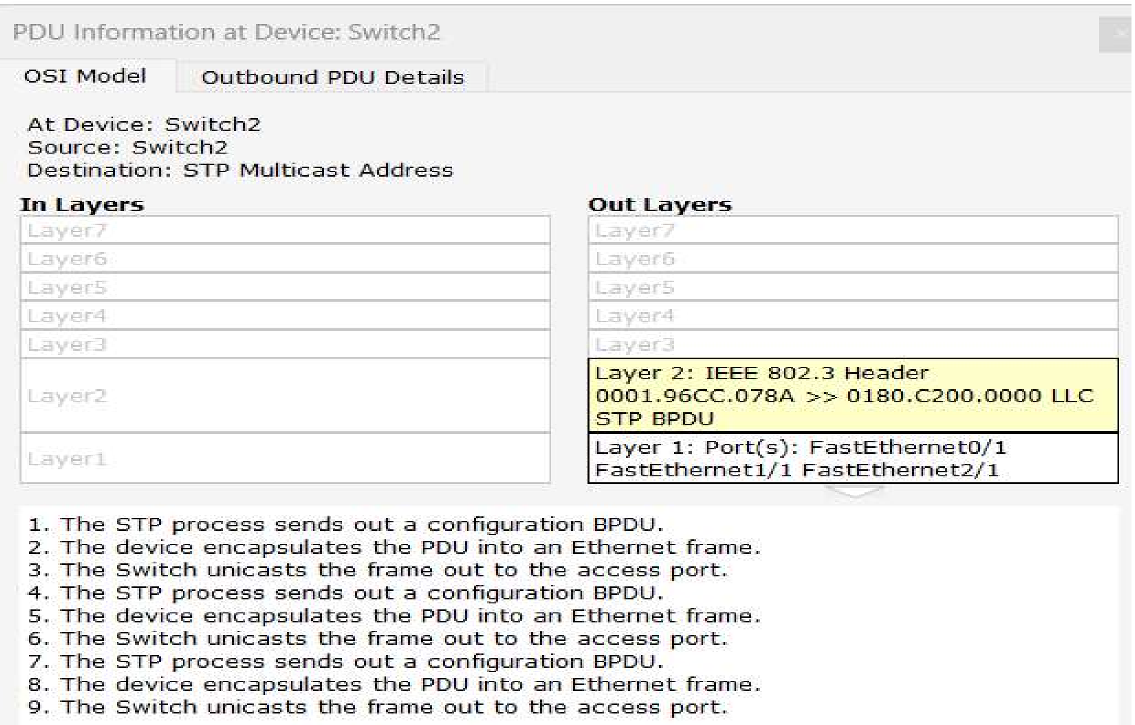
1. FastEthernet0/0 receives the frame.


PDU Information at Device: Router1
OSI Model
Inbound PDU Details
In Layers
Out Layers
Layer6
Layer5
Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

At Device: Router1
Source: Router2
Destination: 255.255.255.255

Layer 7: RIP Version: 1, Command: 2
Layer 4: UDP Src Port: 520, Dst Port: 520
Layer 3: IP Header Src. IP: 50.0.0.2, Dest. IP: 255.255.255.255
Layer 2: HDLC Frame HDLC
Layer 1: Port Serial3/0

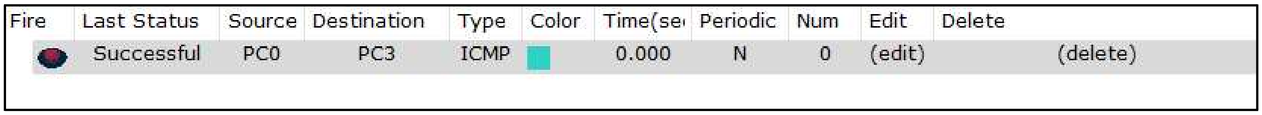
1. Serial3/0 receives the frame.


PDU Information at Device: Switch2
OSI Model
Outbound PDU Details
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1
Layer7
Layer6
Layer5
Layer4
Layer3

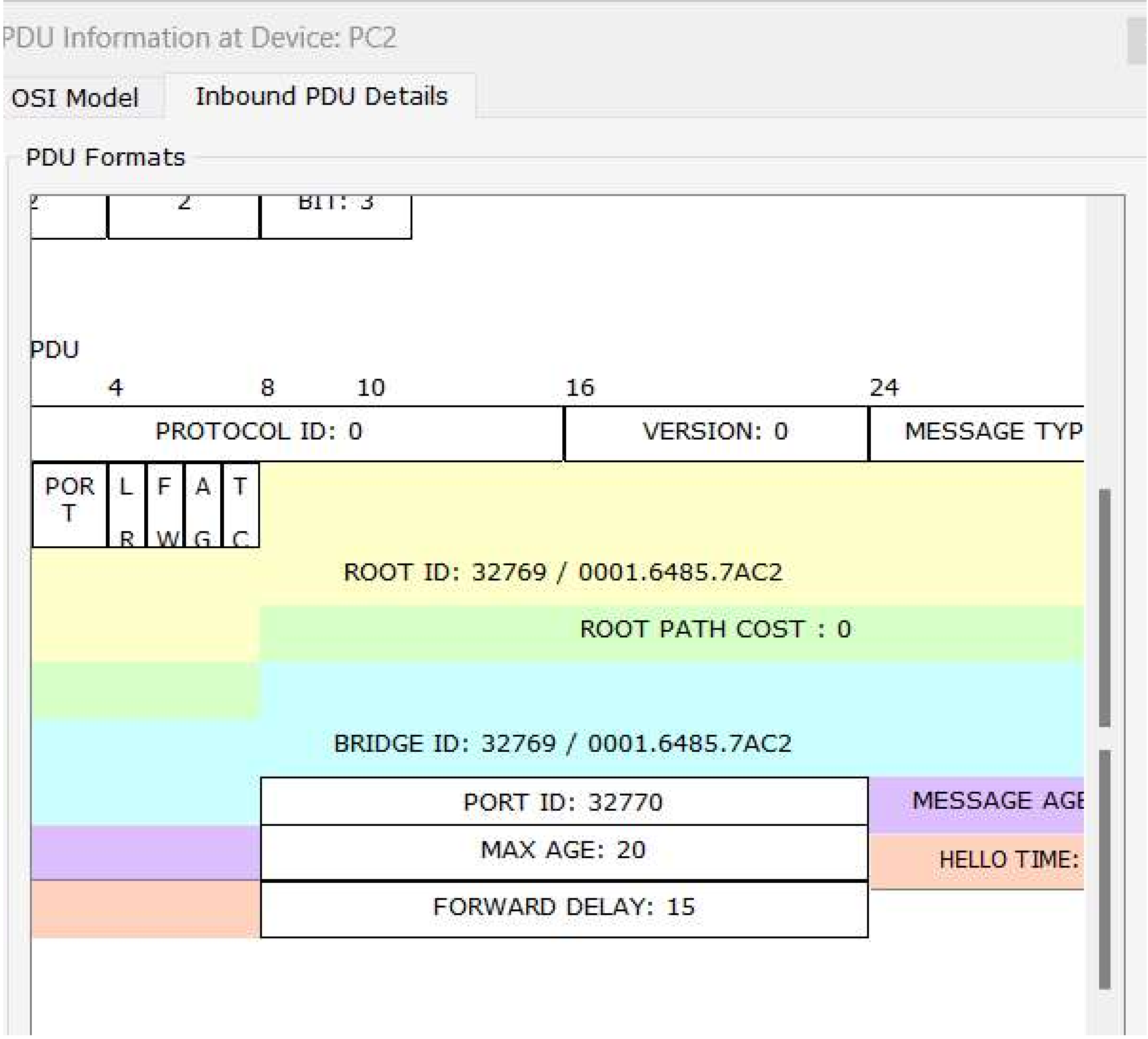
At Device: Switch2
Source: Switch2
Destination: STP Multicast Address

Layer 2: IEEE 802.3 Header 0001.96CC.078A >> 0180.C200.0000 LLC STP BPDU
Layer 1: Port(s): FastEthernet0/1 FastEthernet1/1 FastEthernet2/1

1. The STP process sends out a configuration BPDU.
2. The device encapsulates the PDU into an Ethernet frame.
3. The Switch unicasts the frame out to the access port.
4. The STP process sends out a configuration BPDU.
5. The device encapsulates the PDU into an Ethernet frame.
6. The Switch unicasts the frame out to the access port.
7. The STP process sends out a configuration BPDU.
8. The device encapsulates the PDU into an Ethernet frame.
9. The Switch unicasts the frame out to the access port.



Fire	Last Status	Source	Destination	Type	Color	Time(se	Periodic	Num	Edit	Delete
●	Successful	PC0	PC3	ICMP	🟦	0.000	N	0	(edit)	(delete)


PDU Information at Device: PC2
OSI Model
Inbound PDU Details
PDU Formats
2
BIT: 3
PDU
4
8
10
16
24
POR T
L R
F W
A G
T C

PROTOCOL ID: 0

VERSION: 0

MESSAGE TYP

ROOT ID: 32769 / 0001.6485.7AC2

ROOT PATH COST : 0

BRIDGE ID: 32769 / 0001.6485.7AC2

PORT ID: 32770

MESSAGE AGE

MAX AGE: 20

HELLO TIME:

FORWARD DELAY: 15

Observation:

The TTL field is crucial for network stability, ensuring packets do not circulate endlessly.

This experiment highlights the TTL decrement behavior at each hop and demonstrates its importance in maintaining efficient routing