LINUX NETWORKING MODULE 6 ASSESSMENT SOLUTION

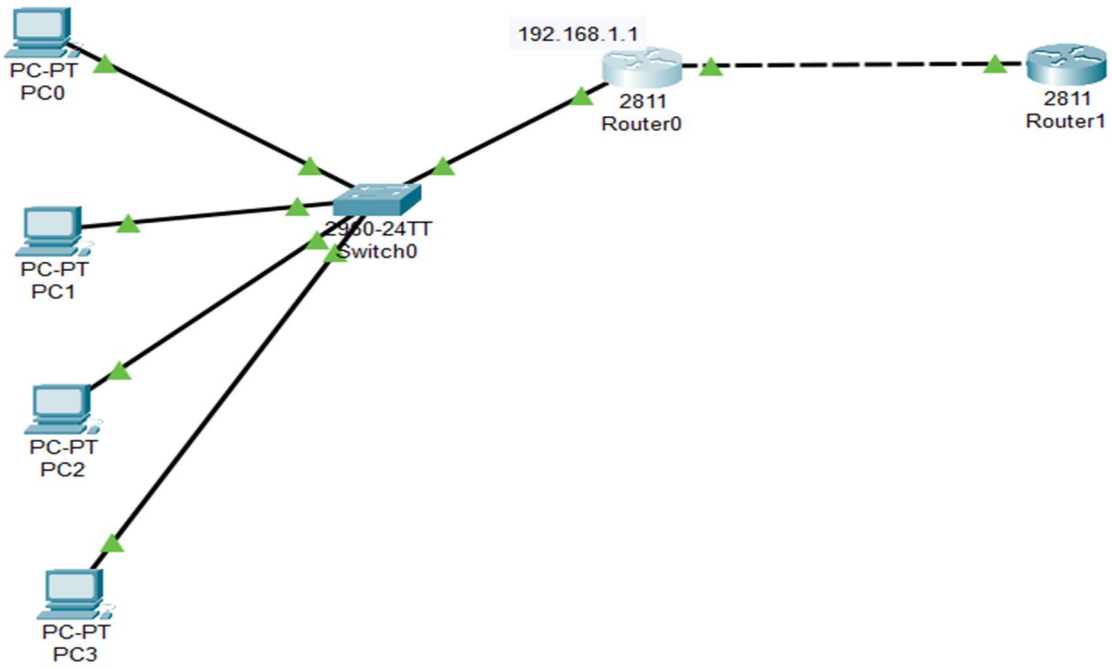
-BY SAKTHI KUMAR S

5. In Cisco Packet Tracer, configure NAT on a router to allow internal devices (192.168.1.x) to access the internet. Test connectivity by pinging an external public IP. Capture the traffic in Wireshark and analyze the source IP before and after NAT translation.

1)Dynamic NAT:

Dynamic NAT: A pool of public IPs is used to assign a temporary public IP.

Topology:



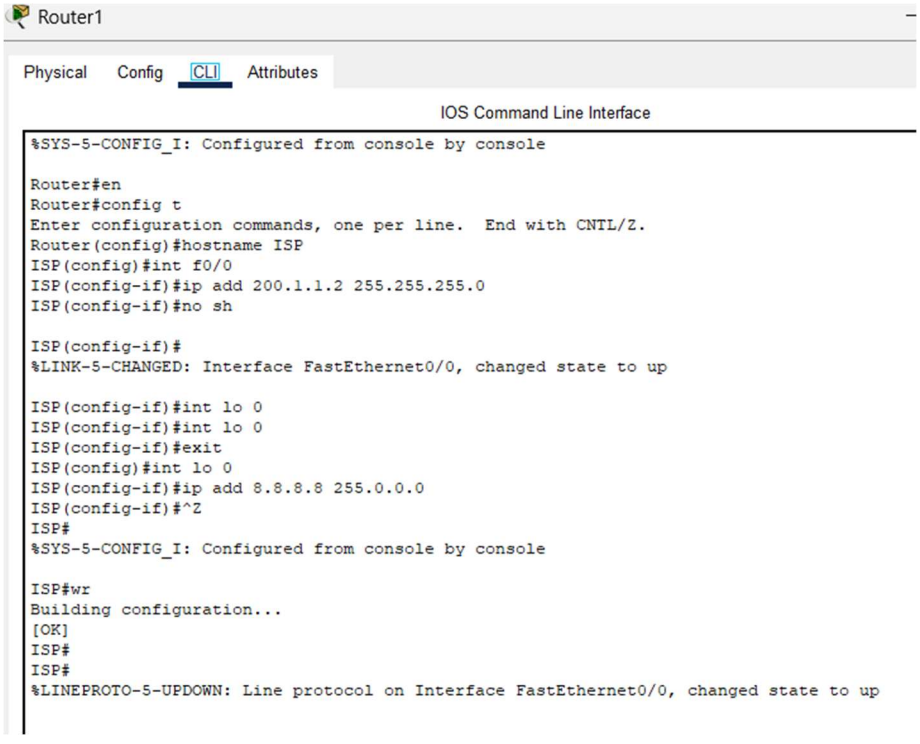
Device	Ip address/subnet address
PC0	192.168.1.2 / 255.255.255.0
PC1	192.168.1.3 / 255.255.255.0
PC2	192.168.1.4 / 255.255.255.0
PC3	192.168.1.5 / 255.255.255.0
Switch	Connected to PCs and Router1
Router0 (NAT)	200.1.1.1 / 255.255.255.0
	192.168.1.1 / 255.255.255.0
Router1 (ISP)	200.1.1.2 / 255.255.255.0
	8.8.8.8 / 255.0.0.0

Router0 Configurations:

```
Router(config)#hostname internal
internal(config)#int f0/0
internal(config-if)#ip addr 200.1.1.1 255.255.255.0
internal(config-if)#no sh

internal(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

internal(config-if)#int f0/1
internal(config-if)#ip addr 192.168.1.1 255.255.255.0
internal(config-if)#no sh

internal(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

internal(config-if)#ip route 0.0.0.0 0.0.0.0 200.1.1.1
%Invalid next hop address (it's this router)
internal(config)#ip route 0.0.0.0 0.0.0.0 200.1.1.2
internal(config)#access-list 1 permit 192.168.1.0 0.0.0.255
internal(config)#ip nat pool abc 200.1.1.3 200.1.1.8 netmask 255.255.255.0
internal(config)#ip nat inside source list 1 pool abc
internal(config)#int f0/0
internal(config-if)#ip nat outside
internal(config-if)#int f0/1
internal(config-if)#ip nat insise
                    ^
% Invalid input detected at '^' marker.

internal(config-if)#ip nat inside
internal(config-if)#en
% Ambiguous command: "en"
internal(config)#exit
internal#
%SYS-5-CONFIG_I: Configured from console by console
```

```
internal#sh ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 200.1.1.6:5       192.168.1.2:5      8.8.8.8:5          8.8.8.8:5
icmp 200.1.1.6:6       192.168.1.2:6      8.8.8.8:6          8.8.8.8:6
icmp 200.1.1.6:7       192.168.1.2:7      8.8.8.8:7          8.8.8.8:7
icmp 200.1.1.6:8       192.168.1.2:8      8.8.8.8:8          8.8.8.8:8

internal#sh ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 200.1.1.3:5       192.168.1.5:5      8.8.8.8:5          8.8.8.8:5
icmp 200.1.1.3:6       192.168.1.5:6      8.8.8.8:6          8.8.8.8:6
icmp 200.1.1.3:7       192.168.1.5:7      8.8.8.8:7          8.8.8.8:7
icmp 200.1.1.3:8       192.168.1.5:8      8.8.8.8:8          8.8.8.8:8
icmp 200.1.1.6:5       192.168.1.2:5      8.8.8.8:5          8.8.8.8:5
icmp 200.1.1.6:6       192.168.1.2:6      8.8.8.8:6          8.8.8.8:6
icmp 200.1.1.6:7       192.168.1.2:7      8.8.8.8:7          8.8.8.8:7
icmp 200.1.1.6:8       192.168.1.2:8      8.8.8.8:8          8.8.8.8:8
icmp 200.1.1.7:5       192.168.1.3:5      8.8.8.8:5          8.8.8.8:5
icmp 200.1.1.7:6       192.168.1.3:6      8.8.8.8:6          8.8.8.8:6
icmp 200.1.1.7:7       192.168.1.3:7      8.8.8.8:7          8.8.8.8:7
icmp 200.1.1.7:8       192.168.1.3:8      8.8.8.8:8          8.8.8.8:8
icmp 200.1.1.8:5       192.168.1.4:5      8.8.8.8:5          8.8.8.8:5
icmp 200.1.1.8:6       192.168.1.4:6      8.8.8.8:6          8.8.8.8:6
icmp 200.1.1.8:7       192.168.1.4:7      8.8.8.8:7          8.8.8.8:7
icmp 200.1.1.8:8       192.168.1.4:8      8.8.8.8:8          8.8.8.8:8
```

Router 1 Configurations:



PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Request timed out.
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time=4ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 4ms, Average = 1ms

C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

PC2

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

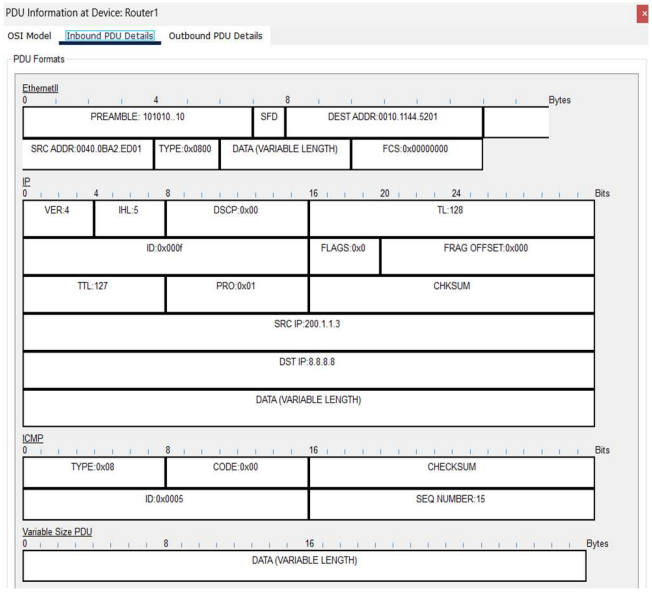
PC3

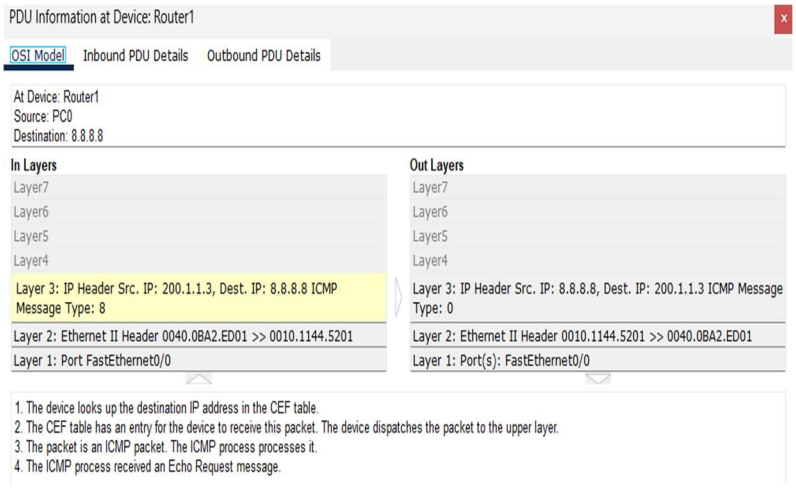
Physical Config Desktop Programming Attributes

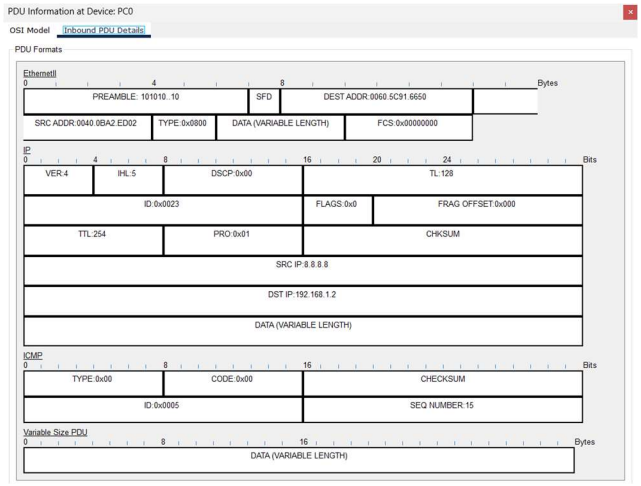
Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time=1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time=12ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 12ms, Average = 3ms

C:\>
```

PDU Frame


PDU Information at Device: Router1
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
Ethernetll
0
4
8
Bytes
PREAMBLE: 101010..10
SFD
DEST ADDR:0010.1144.5201
SRC ADDR:0040.0BA2.ED01
TYPE:0x0800
DATA (VARIABLE LENGTH)
FCS:0x00000000
IP
0
4
8
16
20
24
Bits
VER:4
IHL:5
DSCP:0x00
TL:128
ID:0x000f
FLAGS:0x0
FRAG OFFSET:0x000
TTL:127
PRO:0x01
CHKSUM
SRC IP:200.1.1.3
DST IP:8.8.8.8
DATA (VARIABLE LENGTH)
ICMP
0
8
16
Bits
TYPE:0x08
CODE:0x00
CHECKSUM
ID:0x0005
SEQ NUMBER:15
Variable Size PDU
0
8
16
Bytes
DATA (VARIABLE LENGTH)


PDU Information at Device: Router1
OSI Model
Inbound PDU Details
Outbound PDU Details
At Device: Router1
Source: PC0
Destination: 8.8.8.8
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer 3: IP Header Src. IP: 200.1.1.3, Dest. IP: 8.8.8.8 ICMP Message Type: 8
Layer 3: IP Header Src. IP: 8.8.8.8, Dest. IP: 200.1.1.3 ICMP Message Type: 0
Layer 2: Ethernet II Header 0040.0BA2.ED01 >> 0010.1144.5201
Layer 2: Ethernet II Header 0010.1144.5201 >> 0040.0BA2.ED01
Layer 1: Port FastEthernet0/0
Layer 1: Port(s): FastEthernet0/0
1. The device looks up the destination IP address in the CEF table.
2. The CEF table has an entry for the device to receive this packet. The device dispatches the packet to the upper layer.
3. The packet is an ICMP packet. The ICMP process processes it.
4. The ICMP process received an Echo Request message.



PDU Information at Device: PC0

OSI Model | Inbound PDU Details

At Device: PC0
Source: PC0
Destination: 8.8.8.8

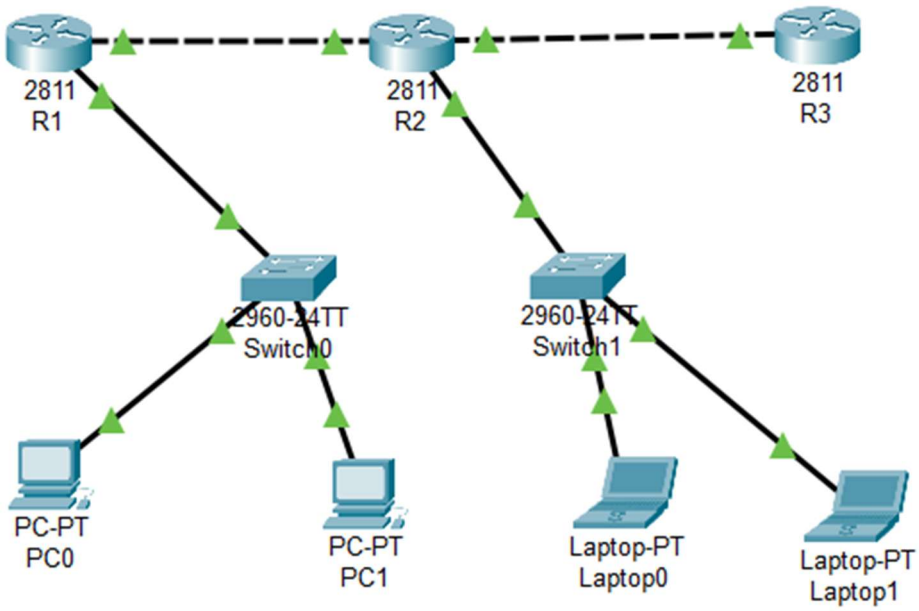
In Layers	Out Layers
Layer7	Layer7
Layer6	Layer6
Layer5	Layer5
Layer4	Layer4
Layer 3: IP Header Src. IP: 8.8.8.8, Dest. IP: 192.168.1.2 ICMP Message Type: 0	Layer3
Layer 2: Ethernet II Header 0040.0BA2.ED02 >> 0060.5C91.6650	Layer2
Layer 1: Port FastEthernet0	Layer1

1. The packet's destination IP address matches the device's IP address or the broadcast address. The device de-encapsulates the packet.
2. The packet is an ICMP packet. The ICMP process processes it.
3. The ICMP process received an Echo Reply message.
4. The Ping process received an Echo Reply message.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Router1	ICMP		0.000	N	0	(edit)	

2)PAT (Port Address Translation): Multiple devices share a single public IP using different port numbers.

Topology:



Device	Ip address/subnet address
PC0	192.168.1.2 / 255.255.255.0
PC1	192.168.1.3 / 255.255.255.0
Laptop 0	192.168.2.2 / 255.255.255.0
Laptop 1	192.168.2.3 / 255.255.255.0
Switch0	Connected to PCs and Router1
Switch1	Connected to PCs and Router1
Router1	192.168.1.1 / 255.255.255.0
	192.168.12.0/ 255.255.255.0
Router2	192.168.12.0/ 255.255.255.0
	192.168.2.1/ 255.255.255.0(fa1/0) additional port)
	200.1.1.1/255.255.255.0
Router3	200.1.1.2/255.255.255.0
	8.8.8.8 /255.0.0.0(lo)

Router 3 Configurations:

```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hohhostname ISP
ISP(config)#int f0/0
ISP(config-if)#ip add 200.1.1.2 255.255.255.0
ISP(config-if)#no sh

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

ISP(config-if)#int lo 0

ISP(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

ISP(config-if)#ip add 8.8.8.8 255.0.0.0
ISP(config-if)#
ISP(config-if)#
ISP(config-if)#exit
ISP(config)#interface FastEthernet0/0
ISP(config-if)#
ISP(config-if)#exit
ISP(config)#interface FastEthernet0/1
ISP(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
```

Router 2 configurations (PAT+OSPF for R1 and R2)

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname r2
r2(config)#hostname R2
R2(config)#int f0/0
R2(config-if)#ip add 192.168.12.2 255.255.255.0
R2(config-if)#no sh

R2(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

R2(config-if)#int f0/1
R2(config-if)#ip add 200.1.1.1 255.255.255.0
R2(config-if)#no sh

R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

R2(config-if)#int f1/0
R2(config-if)#ip add 192.168.2.1 255.255.255.0
R2(config-if)#no sh

R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

R2(config-if)#router ospf 1
R2(config-router)#int f0/0
R2(config-if)#ip ospf 1 area 0
R2(config-if)#int f1/0
R2(config-if)#ip os
00:20:01: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.12.1 on FastEthernet0/0 from LOADING to FULL, Loading ^Z
R2#
%SYS-5-CONFIG_I: Configured from console by console
config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#int f0/0
R2(config-if)#ip ospf 1 area 0
R2(config-if)#int f1/0
R2(config-if)#ip ospf 1 area 0
```

```
R2#en
R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#access-list 1 permit 192.168.1.0 0.0.0.255
R2(config)#access-list 1 permit 192.168.2.0 0.0.0.255
R2(config)#ip nat inside source list 1
% Incomplete command.
R2(config)#ip nat inside source list 1 intf0/1 overload
                                       ^
% Invalid input detected at '^' marker.

R2(config)#ip nat inside source list 1 int f0/1 overload
R2(config)#int f0/0
R2(config-if)#ip nat inside
R2(config-if)#int f0/1
R2(config-if)#ip nat outside
R2(config-if)#int f1/0
R2(config-if)#ip nat inside
R2(config-if)#
00:27:53: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.12.1 on FastEthernet0/0 from FULL to DOWN, Neighbor Down: Dead timer expired

00:27:53: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.12.1 on FastEthernet0/0 from FULL to DOWN, Neighbor Down: Interface down or detached

00:27:58: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.12.1 on FastEthernet0/0 from LOADING to FULL, Loading Done
^Z
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#config t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 0.0.0.0 0.0.0.0 200.1.1.2
R2(config)#router ospf 1
R2(config-router)#default-information originate
R2(config-router)#
R2(config-router)#exit
R2(config)#exit
R2#
%SYS-5-CONFIG_I: Configured from console by console
```

IP NAT translations:

```
R2#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 200.1.1.1:1024    192.168.2.3:1      8.8.8.8:1          8.8.8.8:1024
icmp 200.1.1.1:1025    192.168.2.3:2      8.8.8.8:2          8.8.8.8:1025
icmp 200.1.1.1:1026    192.168.2.3:3      8.8.8.8:3          8.8.8.8:1026
icmp 200.1.1.1:1027    192.168.2.3:4      8.8.8.8:4          8.8.8.8:1027

R2#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 200.1.1.1:1024    192.168.2.3:5      8.8.8.8:5          8.8.8.8:1024
icmp 200.1.1.1:1025    192.168.2.3:6      8.8.8.8:6          8.8.8.8:1025
icmp 200.1.1.1:1026    192.168.2.3:7      8.8.8.8:7          8.8.8.8:1026
icmp 200.1.1.1:1027    192.168.2.3:8      8.8.8.8:8          8.8.8.8:1027
icmp 200.1.1.1:10      192.168.2.2:10     8.8.8.8:10         8.8.8.8:10
icmp 200.1.1.1:11      192.168.2.2:11     8.8.8.8:11         8.8.8.8:11
icmp 200.1.1.1:12      192.168.2.2:12     8.8.8.8:12         8.8.8.8:12
icmp 200.1.1.1:13      192.168.1.2:13     8.8.8.8:13         8.8.8.8:13
icmp 200.1.1.1:14      192.168.1.2:14     8.8.8.8:14         8.8.8.8:14
icmp 200.1.1.1:15      192.168.1.2:15     8.8.8.8:15         8.8.8.8:15
icmp 200.1.1.1:16      192.168.1.2:16     8.8.8.8:16         8.8.8.8:16
icmp 200.1.1.1:5       192.168.1.3:5      8.8.8.8:5          8.8.8.8:5
icmp 200.1.1.1:6       192.168.1.3:6      8.8.8.8:6          8.8.8.8:6
icmp 200.1.1.1:7       192.168.1.3:7      8.8.8.8:7          8.8.8.8:7
icmp 200.1.1.1:8       192.168.1.3:8      8.8.8.8:8          8.8.8.8:8
icmp 200.1.1.1:9       192.168.2.2:9      8.8.8.8:9          8.8.8.8:9
```

Router1 Configurations:

```
Router>
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#int f0/0
R1(config-if)#ip add 192.168.12.1 255.255.255.0
R1(config-if)#no sh

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

R1(config-if)#int f0/1
R1(config-if)#ip add 192.168.1.1 255.255.255.0
R1(config-if)#no sh

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

R1(config-if)#int f0/0
R1(config-if)#ip ospf 1 area 0
R1(config-if)#int f0/1
R1(config-if)#ip ospf 1 area 0
R1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

00:22:04: %OSPF-5-ADJCHG: Process 1, Nbr 200.1.1.1 on FastEthernet0/0 from LOADING to FULL, Loading Done

R1(config-if)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#wr
Building configuration...
[OK]
```

```
R1#show 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 192.168.12.2 to network 0.0.0.0

     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, FastEthernet0/1
L       192.168.1.1/32 is directly connected, FastEthernet0/1
O    192.168.2.0/24 [110/2] via 192.168.12.2, 00:09:13, FastEthernet0/0
     192.168.12.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.12.0/24 is directly connected, FastEthernet0/0
L       192.168.12.1/32 is directly connected, FastEthernet0/0
O*E2 0.0.0.0/0 [110/1] via 192.168.12.2, 00:00:20, FastEthernet0/0
```

Ping Tests:

PC0

Physical | Config | Desktop | Programming | Attributes

Command Prompt

```
Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time=9ms TTL=253
Reply from 8.8.8.8: bytes=32 time=68ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time=1ms TTL=253

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 68ms, Average = 19ms

C:\>tracert 8.8.8.8

Tracing route to 8.8.8.8 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      192.168.1.1
  2    0 ms      0 ms      0 ms      192.168.12.2
  3    0 ms      0 ms      0 ms      8.8.8.8

Trace complete.

C:\>ping 192.168.2.2

Pinging 192.168.2.2 with 32 bytes of data:

Reply from 192.168.2.2: bytes=32 time<1ms TTL=126
Reply from 192.168.2.2: bytes=32 time<1ms TTL=126
Reply from 192.168.2.2: bytes=32 time<1ms TTL=126
Reply from 192.168.2.2: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

PC1

Physical Config Desktop Programming Attributes

Command Prompt

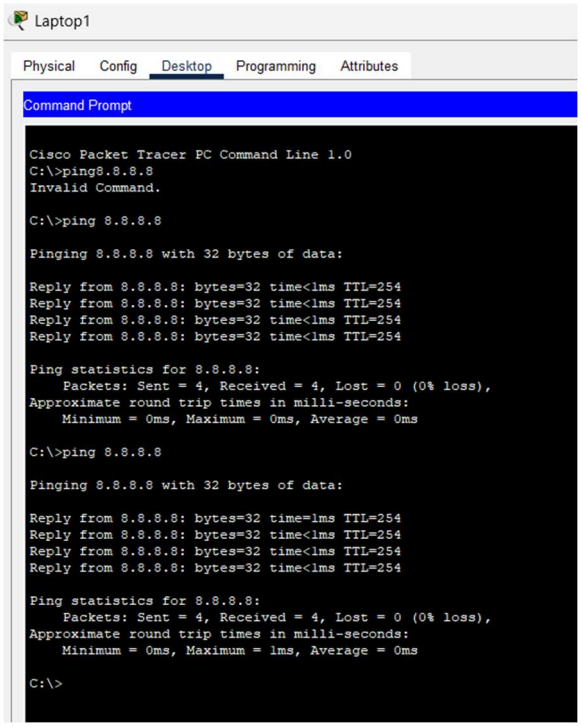
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time=13ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 13ms, Average = 3ms

C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253
Reply from 8.8.8.8: bytes=32 time<1ms TTL=253

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Laptop0

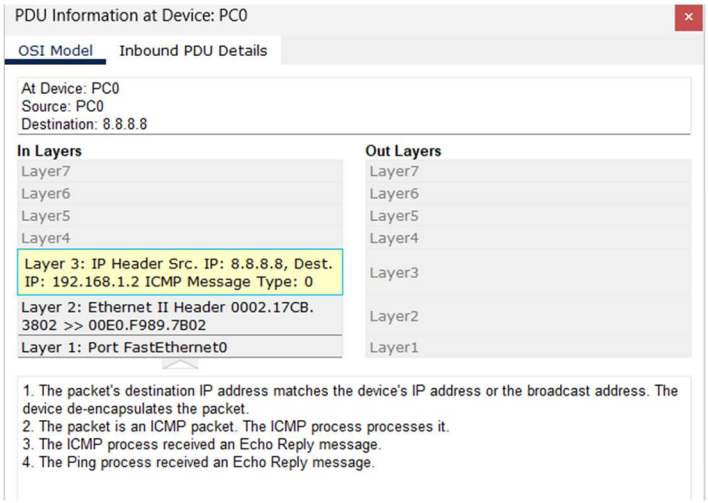
Physical Config Desktop Programming Attributes

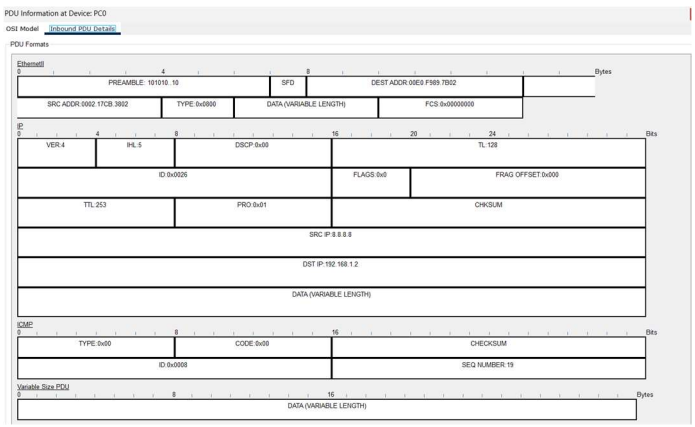
Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time<1ms TTL=254
Reply from 8.8.8.8: bytes=32 time=41ms TTL=254

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 41ms, Average = 10ms
```



PDU Packet Frame:

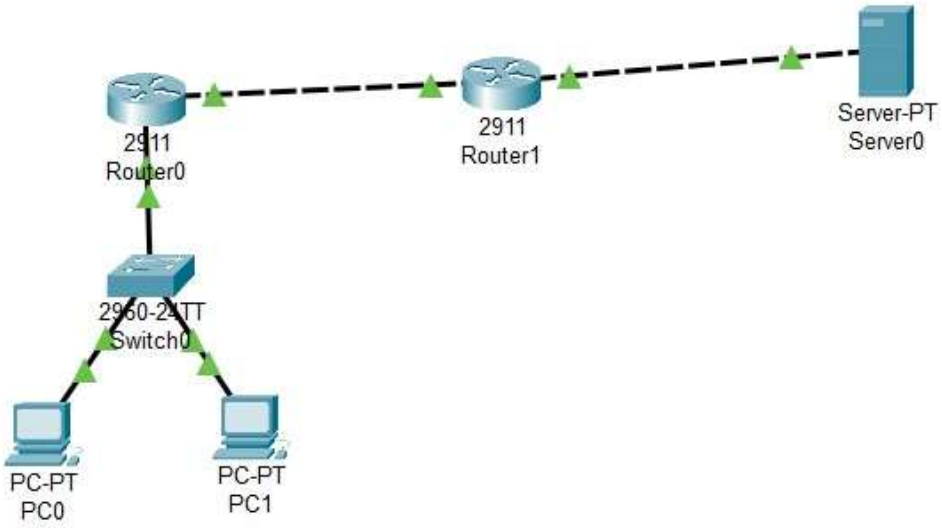




Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	R3	ICMP		0.000	N	0	(edit)

3)Static NAT: One-to-one mapping of private to public IP.

Topology:



Device	Ip address/subnet address
PC0	192.168.1.2 / 255.255.255.0
PC1	192.168.1.3 / 255.255.255.0
Switch	Connected to PCs and Router1
Router0 (NAT)	192.168.1.1 / 255.255.255.0
	200.0.0.2 / 255.255.255.252
Router1 (ISP)	200.0.0.1 / 255.255.255.252
	8.8.8.1 / 255.255.255.0
Server	8.8.8.8 / 255.255.255.0

NAT settings on Router0:

```
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip nat inside
Router(config-if)#
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#ip nat outside
Router(config-if)#exit
```

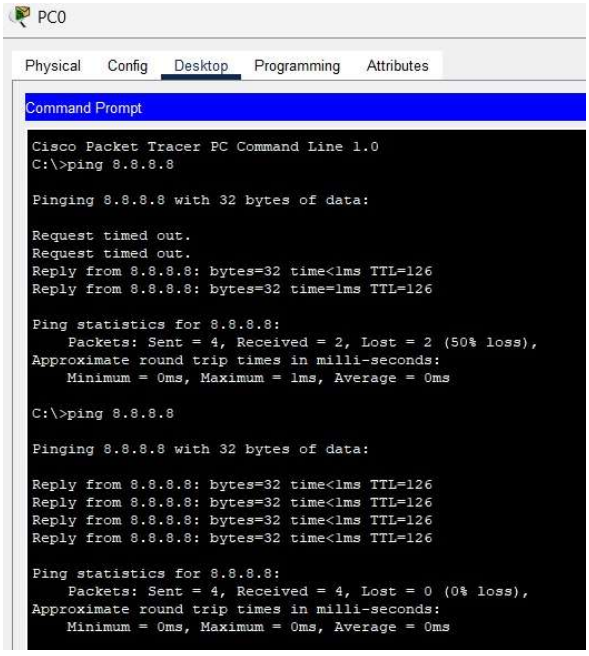
Static NAT:

```
Router(config)#ip nat inside source static 192.168.1.3 200.0.0.4
Router(config)#ip nat inside source static 192.168.1.2 200.0.0.3
```

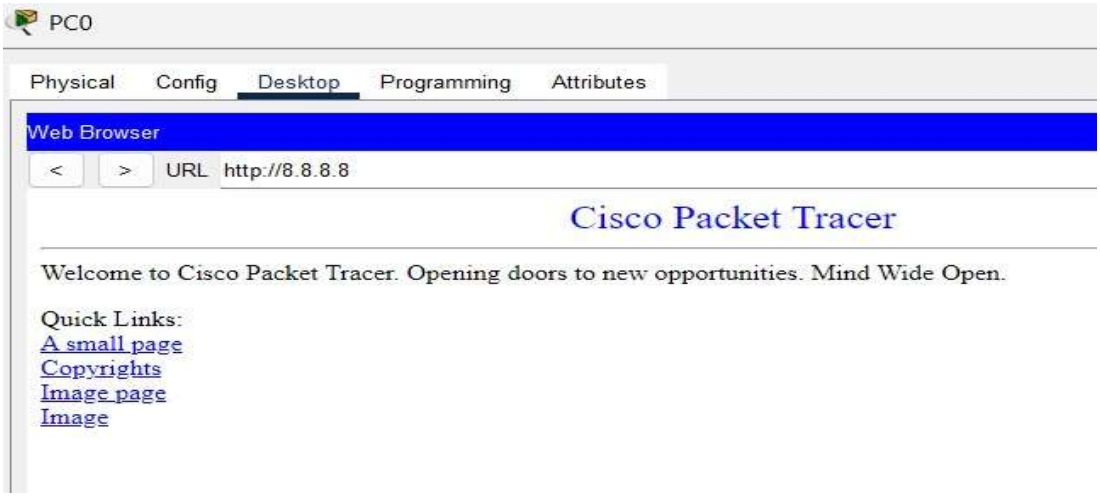
NAT Table:

```
Router#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
---  200.0.0.3         192.168.1.2        ---                ---
---  200.0.0.4         192.168.1.3        ---                ---
```

Ping Test :

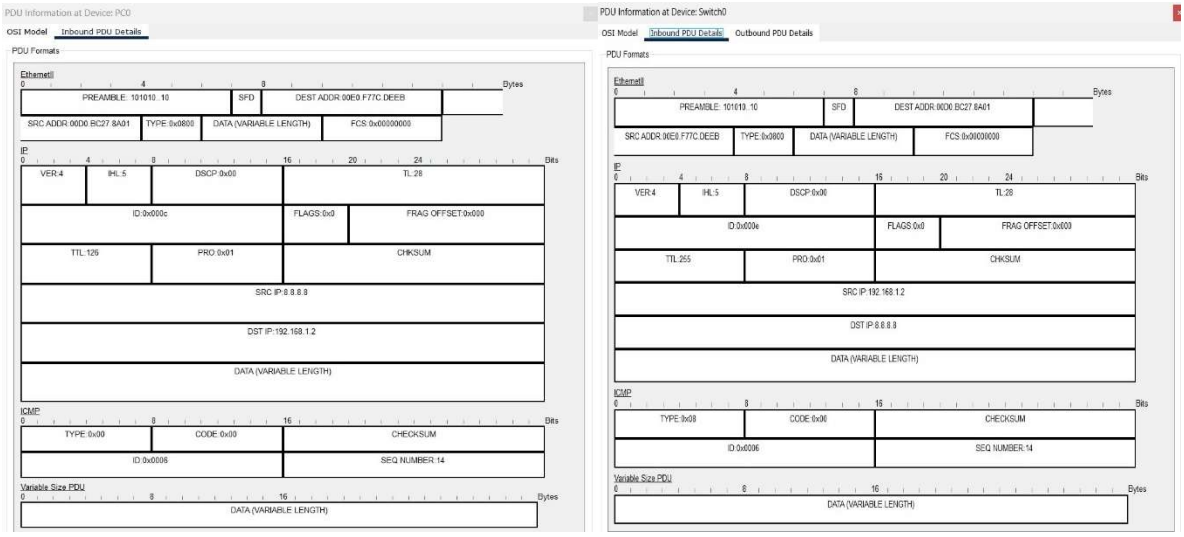


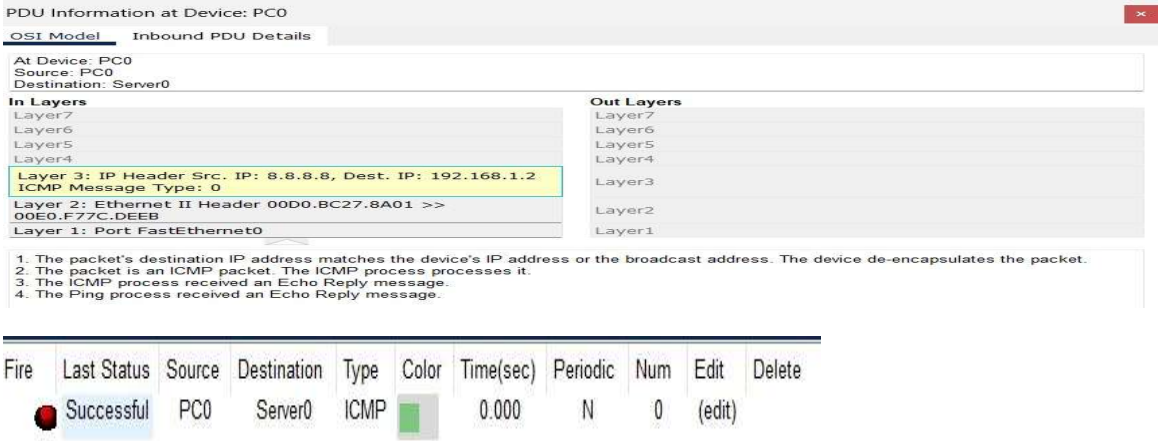

```
C:\>tracert 8.8.8.8

Tracing route to 8.8.8.8 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      192.168.1.1
  2    0 ms      0 ms      0 ms      200.0.0.1
  3    0 ms      0 ms      0 ms      8.8.8.8

Trace complete.
```



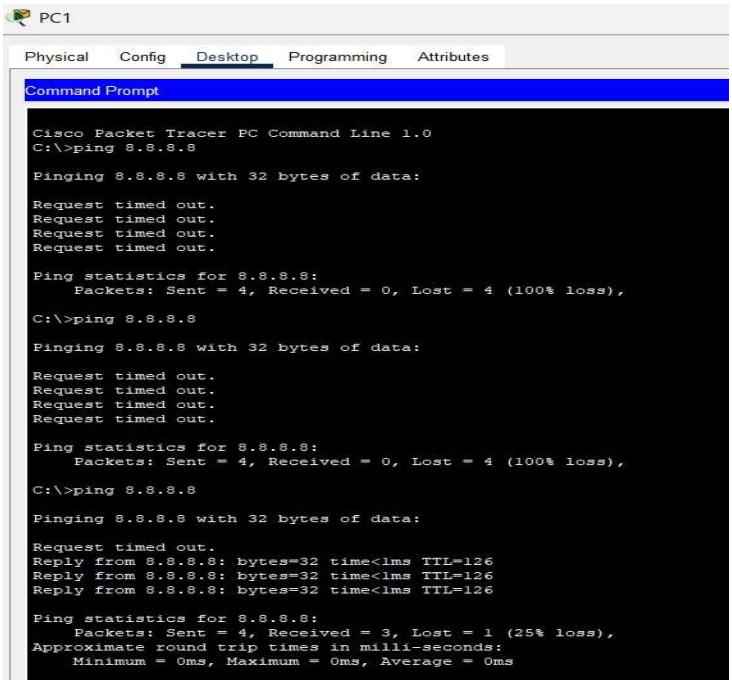
Ping PDU Frame Analysis:

The Frames shows the source and destination and how the Ping is successful with Echo Reply Message.





Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	Server0	ICMP		0.000	N	0	(edit)	


PC1
Physical
Config
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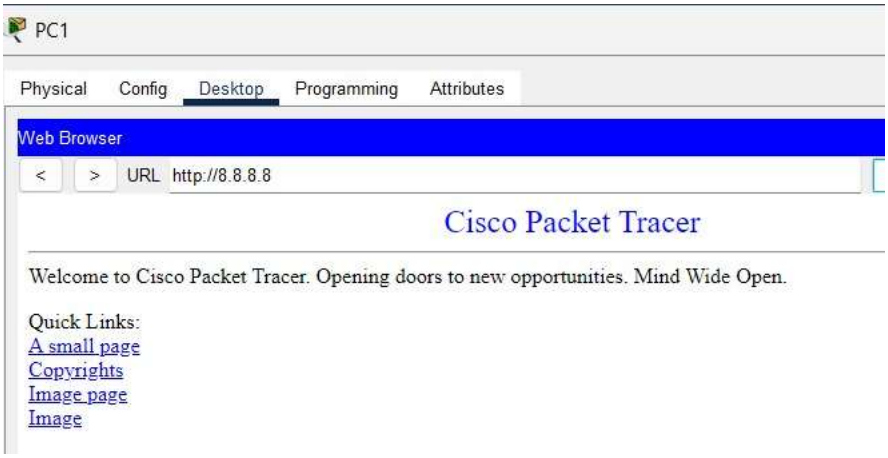
Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8
Pinging 8.8.8.8 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 8.8.8.8:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 8.8.8.8
Pinging 8.8.8.8 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 8.8.8.8:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 8.8.8.8
Pinging 8.8.8.8 with 32 bytes of data:
Request timed out.
Reply from 8.8.8.8: bytes=32 time<1ms TTL=126
Reply from 8.8.8.8: bytes=32 time<1ms TTL=126
Reply from 8.8.8.8: bytes=32 time<1ms TTL=126
Ping statistics for 8.8.8.8:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms


PC1
Physical
Config
Desktop
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Attributes
Web Browser
URL
http://8.8.8.8
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