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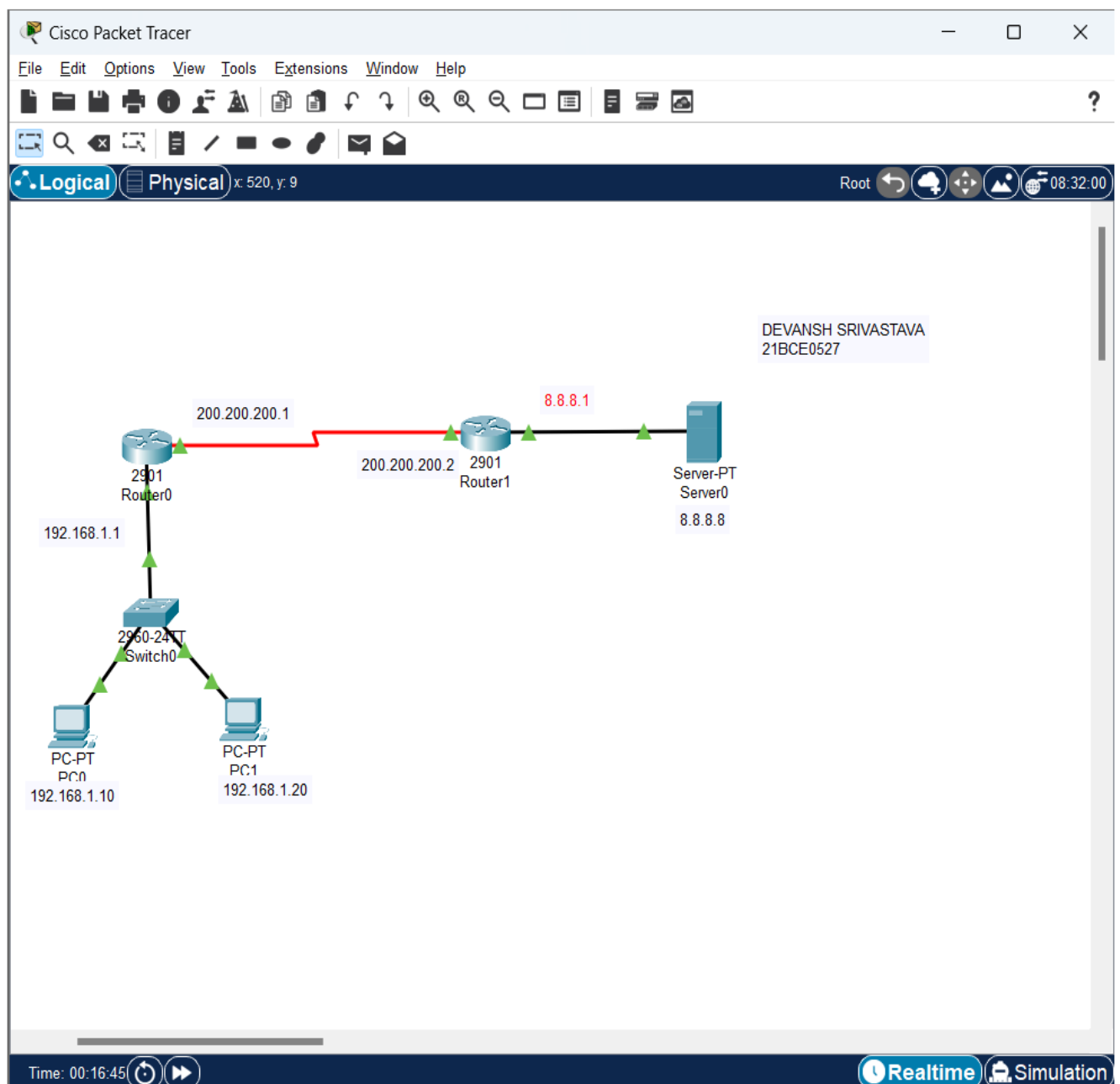
Registration No:21BCE0527

Network Training Programme

Module 6

Q5. 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.

Network Diagram:



## PC0 IP Configuration

PC0

Physical Config **Desktop** Programming Attributes

**IP Configuration** X

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 192.168.1.10

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::201:64FF:FEA6:22B

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

## PC1 IP Configuration

PC1

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.20

Subnet Mask255.255.255.0

Default Gateway192.168.1.1

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

Link Local AddressFE80::260:2FFF:FE1D:5DD

Default Gateway

DNS Server

802.1X

Use 802.1X Security

AuthenticationMD5

Username

Password

Top

## Router 0 Configuration

Router0

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

Serial0/0/0

Serial0/0/1

FastEthernet0/1/0

FastEthernet0/1/1

FastEthernet0/1/2

FastEthernet0/1/3

GigabitEthernet0/2/0

GigabitEthernet0/0

Port Status

Bandwidth

Duplex

MAC Address

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

1000 Mbps

100 Mbps

10 Mbps

Auto

Auto

Auto

0030.A33A.8E01

192.168.1.1

10

Equivalent IOS Commands

Router>enable

Router#

Router#configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#interface GigabitEthernet0/0

Router(config-if)#no shutdown

Router(config-if)#

%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

Top

Router0

Physical
Config
CLI
Attributes

GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
Serial0/0/0
Serial0/0/1
FastEthernet0/1/0
FastEthernet0/1/1
FastEthernet0/1/2
FastEthernet0/1/3
GigabitEthernet0/2/0

Serial0/0/0
Port Status
Duplex
Clock Rate
IP Configuration
IPv4 Address
Subnet Mask
Tx Ring Limit

Full Duplex
2000000
200.200.200.1
255.255.255.0
10

On

Equivalent IOS Commands

```

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
ip address 192.168.1.1 255.255.255.0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#no shutdown
Router(config-if)#no ip address
Router(config-if)#ip address 200.200.200.1 255.255.255.0
Router(config-if)#

```

Top

Router1 Configuration

Router1

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

Serial0/0/0

Serial0/0/1

FastEthernet0/1/0

FastEthernet0/1/1

FastEthernet0/1/2

FastEthernet0/1/3

GigabitEthernet0/2/0

Serial0/0/0

Port Status

Duplex

Clock Rate

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

Full Duplex

1200

200.200.200.2

255.255.255.0

10

On

Equivalent IOS Commands

Vlan1

unassigned

YES

unset

administratively down

down

Router#

Router#

Router#configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#interface GigabitEthernet0/0

Router(config-if)#

Router(config-if)#exit

Router(config)#interface Serial0/0/0

Router(config-if)#ip address 200.200.200.2 255.255.255.0

Router(config-if)#ip address 200.200.200.2 255.255.255.0

Router(config-if)#

Top

Router1

Physical **Config** CLI Attributes

**GLOBAL**

Settings

Algorithm Settings

**ROUTING**

Static

RIP

**SWITCHING**

VLAN Database

**INTERFACE**

GigabitEthernet0/0

GigabitEthernet0/1

Serial0/0/0

Serial0/0/1

FastEthernet0/1/0

FastEthernet0/1/1

FastEthernet0/1/2

FastEthernet0/1/3

GigabitEthernet0/2/0

**GigabitEthernet0/0**

Port Status ☒ On

Bandwidth ☐ 1000 Mbps ☐ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☐ Full Duplex ☒ Auto

MAC Address 0050.0F34.BB01

IP Configuration

IPv4 Address 8.8.8.1

Subnet Mask 255.0.0.0

Tx Ring Limit 10

Equivalent IOS Commands

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
ip address 8.8.8.1 255.0.0.0
Router(config-if)#
```

☐ Top

## IP Routing

```
Router#enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 192.168.1.0 255.255.255.0 200.200.200.1
exit
Router(config-if)#
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

```
Router#show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	8.8.8.1	YES	manual	up	up
GigabitEthernet0/1	unassigned	YES	unset	administratively down	down
Serial0/0/0	200.200.200.2	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	administratively down	down
FastEthernet0/1/0	unassigned	YES	unset	up	down
FastEthernet0/1/1	unassigned	YES	unset	up	down
FastEthernet0/1/2	unassigned	YES	unset	up	down
FastEthernet0/1/3	unassigned	YES	unset	up	down
GigabitEthernet0/2/0	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down

Router#

☐ Top

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## Server Setup

Server0

Physical
Config
Services
Desktop
Programming
Attributes

IP Configuration
X

IP Configuration

☐ DHCP
☒ Static

IPv4 Address
8.8.8.8

Subnet Mask
255.0.0.0

Default Gateway
8.8.8.1

DNS Server
0.0.0.0

IPv6 Configuration

☐ Automatic
☒ Static

IPv6 Address
/

Link Local Address
FE80::201:C9FF:FE57:973E

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication
MD5

Username

Password

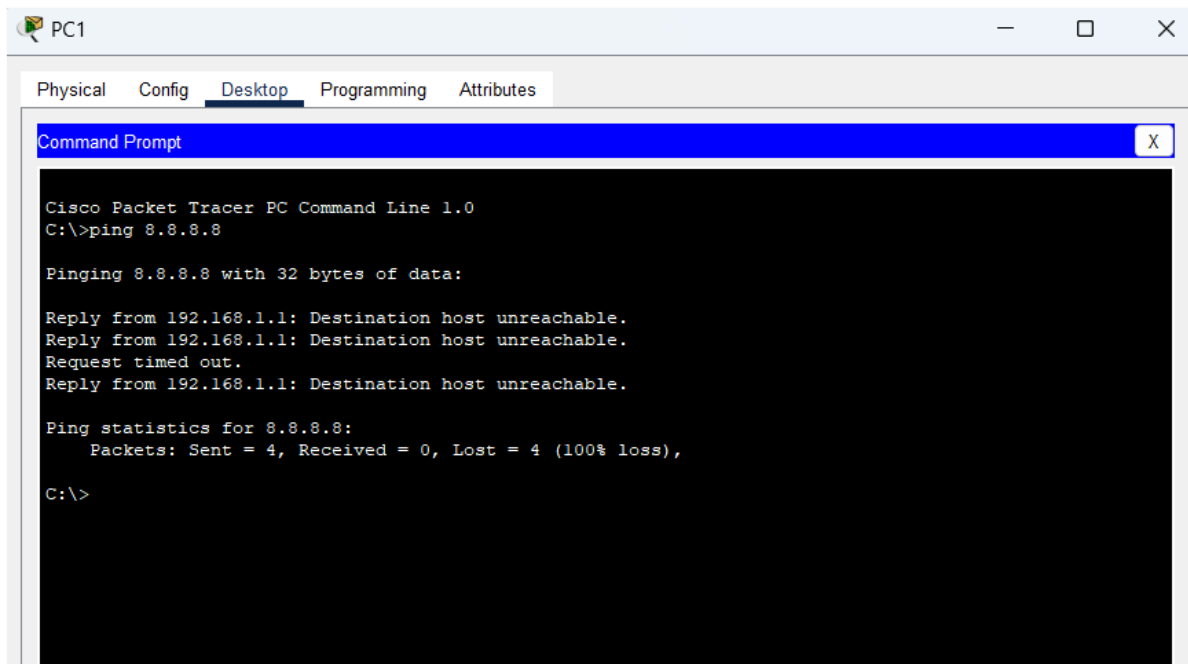
☐ Top

Before NAT Translation



PC1

Pinging to server



```
PC1
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8

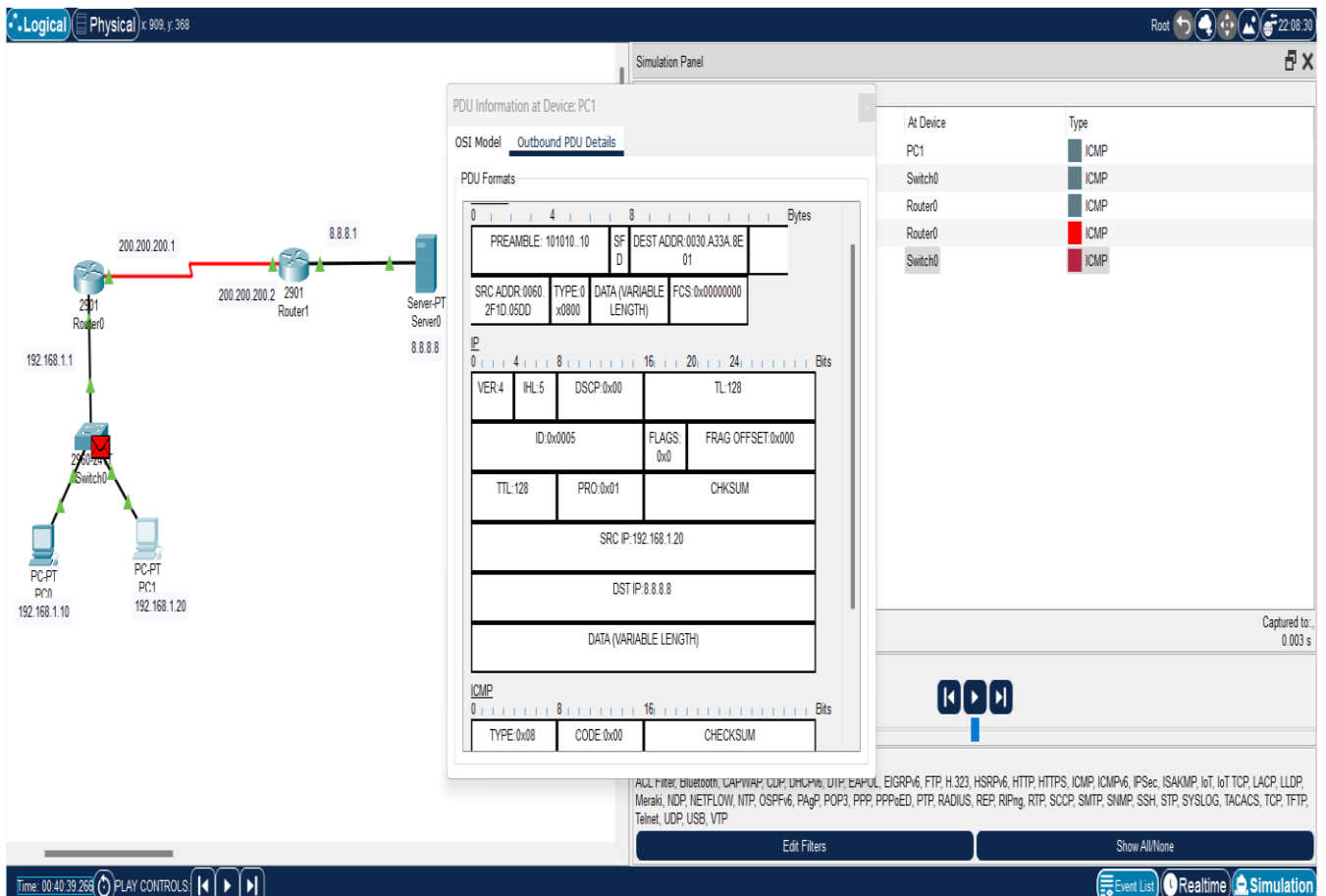
Pinging 8.8.8.8 with 32 bytes of data:

Reply from 192.168.1.1: Destination host unreachable.
Reply from 192.168.1.1: Destination host unreachable.
Request timed out.
Reply from 192.168.1.1: Destination host unreachable.

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

In Simulation Mode



The screenshot shows the Cisco Packet Tracer interface in Simulation Mode. The network topology includes Router0 (200.200.200.1), Router1 (200.200.200.2), Server-PT (8.8.8.8), Switch0 (192.168.1.1), and two PCs (PC0: 192.168.1.10, PC1: 192.168.1.20). A red line indicates the path of the captured packet from PC1 to Router0.

**PDU Information at Device: PC1**

OSI Model: Outbound PDU Details

PDU Formats

Bytes			
PREAMBLE: 10101010	SF: 0	DEST ADDR: 0030 A33A 8E 01	
SRC ADDR: 0060 2F 1D 05DD	TYPE: 0	DATA (VARIABLE LENGTH)	FCS: 0x00000000

Bits			
VER: 4	IHL: 5	DSCP: 0x00	TL: 128
ID: 0x0005		FLAGS: 0x0	FRAG OFFSET: 0x00
TTL: 128	PRO: 0x01	CHKSUM	
SRC IP: 192.168.1.20			
DST IP: 8.8.8.8			
DATA (VARIABLE LENGTH)			

ICMP		
TYPE: 0x08	CODE: 0x00	CHECKSUM

At Device | Type

At Device	Type
PC1	ICMP
Switch0	ICMP
Router0	ICMP
Router0	ICMP
Switch0	ICMP

Time: 00:40:39.266 | PLAY CONTROLS | Event List | Realtime | Simulation

NAT Configuration on Router0

```

Router#
Router#
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#ip nat inside
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface Serial0/0/0
Router(config-if)#ip address 200.200.200.2 255.255.255.252
Router(config-if)#ip nat outside
Router(config-if)#no shutdown
Router(config-if)#exit

Router(config)#access-list 1 permit 192.168.1.0 0.0.0.255
Router(config)#ip nat inside source list 1 interface Serial0/0/0 overload
Router(config)#ip route 0.0.0.0 0.0.0.0 200.200.200.1
Router(config)#

```

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## NAT Configuration on Router1

```

Router#
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Serial0/0/0
Router(config-if)#ip address 200.200.200.1 255.255.255.252
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 8.8.8.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit

Router(config)#ip route 192.168.1.0 255.255.255.0 200.200.200.2
Router(config)#ip route 0.0.0.0 0.0.0.0 8.8.8.8
Router(config)#

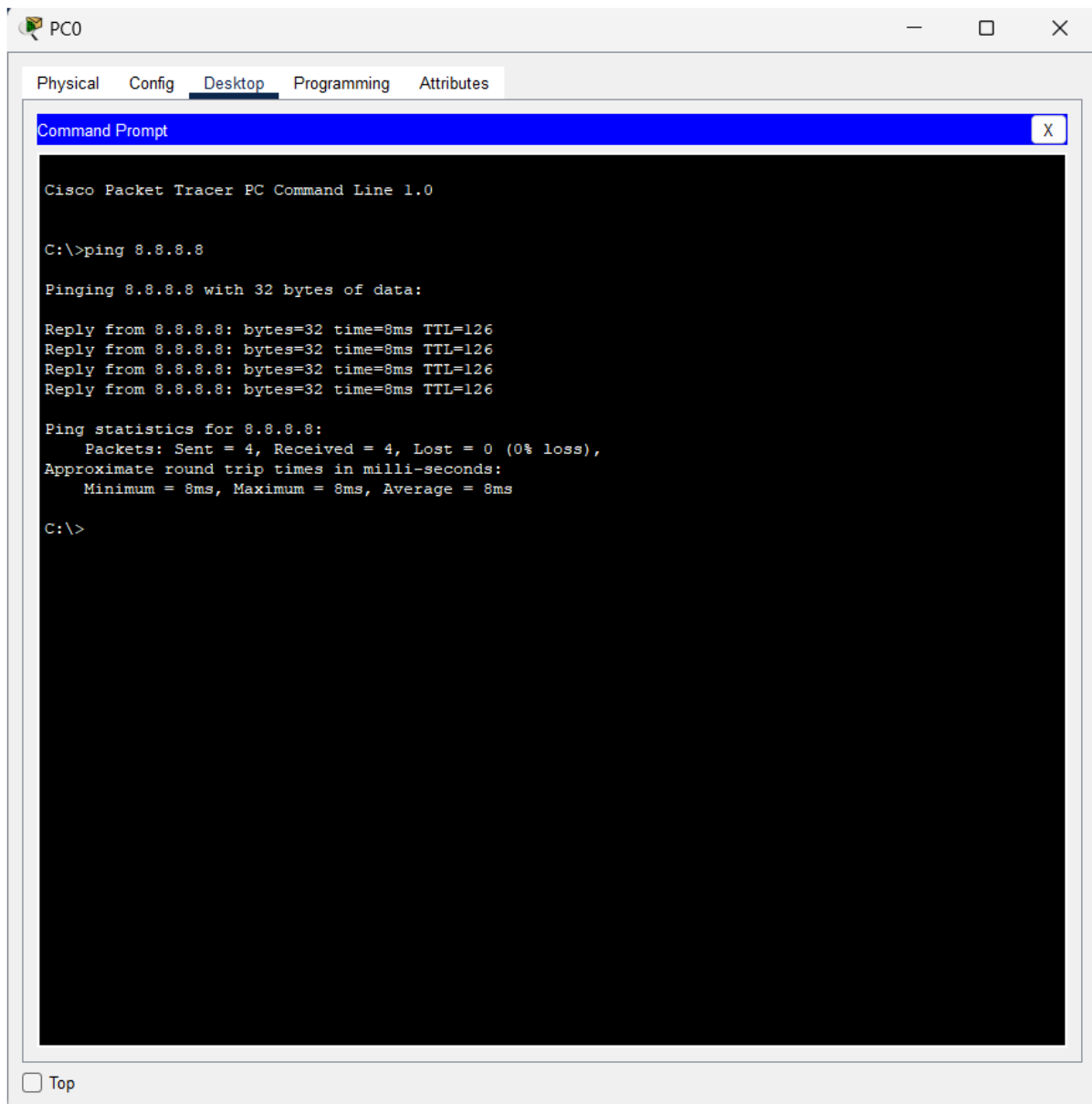
```

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Pinging from PC0 to Server successful



Source IP address changed (NAT Successful )

Logical Physical x.201, y.48

Simulation Panel

PDU Information at Device: Router1

OST Model Inbound PDU Details Outbound PDU Details

PDU Formats

HDLCL

0 4 8 16 20 24 Bits

FLG: 0x7E ADR: 0x0f CONTROL: 0x0000

DATA (VARIABLE LENGTH)

FCS: 0x0000 FLG: 0x7E

IP

0 4 8 16 20 24 Bits

VER: 4 IHL: 5 DSCP: 0x00 TL: 128

ID: 0x000a FLAGS: 0x0 FRAG OFFSET: 0x000

TTL: 127 PRO: 0x01 CHKSUM

SRC IP: 200.200.200.2

DST IP: 8.8.8.8

DATA (VARIABLE LENGTH)

ICMP

At Device Type

At Device	Type
PC0	ICMP
Switch0	ICMP
Router0	ICMP
Router1	ICMP
Server0	ICMP
Router1	ICMP
Router0	ICMP
Switch0	ICMP

Captured to: 0.007 s

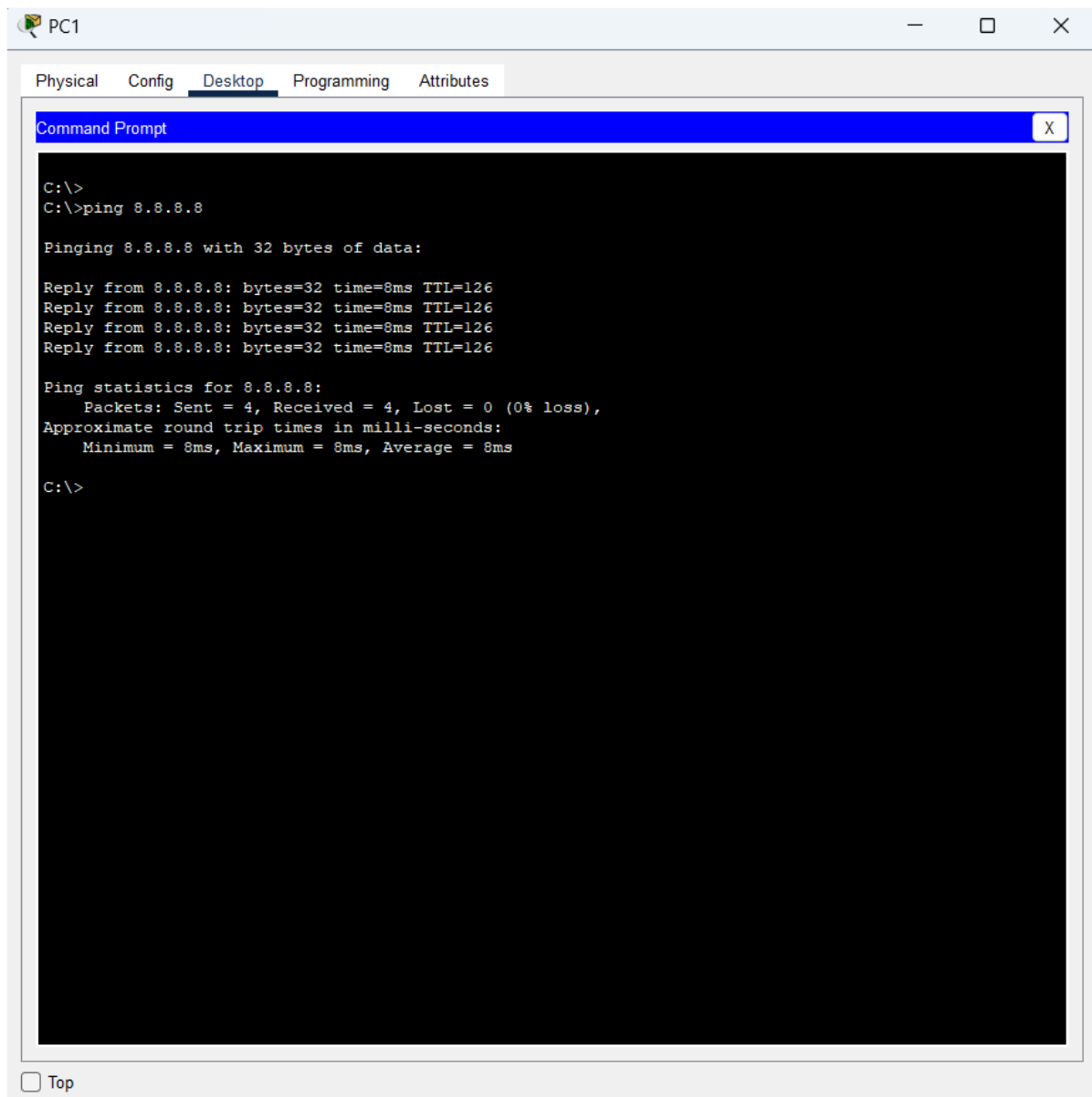
Time: 00:45:06.281 PLAY CONTROLS

Event List Realtime Simulation

Meraki, NDP, NETFLOW, NTP, OSPFv6, PAgP, POP3, PPP, PPPoE, PTP, RADIUS, REP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, USB, VTP

Edit Filters Show All/None

Pinging from PC1 to server succesful



Source IP address changed (NAT Successful )

Logical Physical | 1038, y: 40 | Root | 11:12:30

Simulation Panel

PDU Information at Device: Router1

OST Model | Inbound PDU Details | Outbound PDU Details

PDU Formats

HDL C

0 8 16 Bits

FLG: 0x7E ADR: 0x8f CONTROL: 0x0000

DATA (VARIABLE LENGTH)

FCS: 0x0000 FLG: 0x7E

IP

0 4 8 16 20 24 Bits

VER: 4 IHL: 5 DSCP: 0x00 TL: 128

ID: 0x000e FLAGS: 0x0 FRAG OFFSET: 0x000

TTL: 127 PRO: 0x01 CHKSUM

SRC IP: 200.200.200.2

DST IP: 8.8.8.8

DATA (VARIABLE LENGTH)

At Device	Type
PC1	ICMP
Switch0	ICMP
Router0	ICMP
Router1	ICMP
Switch0	STP
PC1	STP
Router0	STP
PC0	STP
Switch0	STP
PC1	STP
Router0	STP
PC0	STP
PC0	ICMP

Captured to: 2.842 s

Filter: All Filter, Bluetooth, CAPWAP, CDP, DHCPv6, DHCP, EAPOL, EIGRPv6, FTP, H.323, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPsec, ISAKMP, IoT, IoT TCP, LACP, LLDP, Meraki, NDP, NETFLOW, NTP, OSPFv6, PAgP, POP3, PPP, PPPoE, PTP, RADIUS, REP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, USB, VTP

Edit Filters | Show All/None

Time: 00:41:07.250 | PLAY CONTROLS | Event List | Realtime | Simulation

## Verification

Command: show ip nat translations() on Router0

```
Router#
Router#show ip nat translations
Pro  Inside global      Inside local      Outside local      Outside global
icmp 200.200.200.2:10  192.168.1.10:10   8.8.8.8:10         8.8.8.8:10
icmp 200.200.200.2:11  192.168.1.10:11   8.8.8.8:11         8.8.8.8:11
icmp 200.200.200.2:12  192.168.1.10:12   8.8.8.8:12         8.8.8.8:12
icmp 200.200.200.2:19  192.168.1.20:19   8.8.8.8:19         8.8.8.8:19
icmp 200.200.200.2:20  192.168.1.20:20   8.8.8.8:20         8.8.8.8:20
icmp 200.200.200.2:21  192.168.1.20:21   8.8.8.8:21         8.8.8.8:21
icmp 200.200.200.2:22  192.168.1.20:22   8.8.8.8:22         8.8.8.8:22
icmp 200.200.200.2:6   192.168.1.10:6    8.8.8.8:6          8.8.8.8:6
icmp 200.200.200.2:7   192.168.1.10:7    8.8.8.8:7          8.8.8.8:7
icmp 200.200.200.2:8   192.168.1.10:8    8.8.8.8:8          8.8.8.8:8
icmp 200.200.200.2:9   192.168.1.10:9    8.8.8.8:9          8.8.8.8:9
Router#
```

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Before NAT Translation

**Source IP Address: 198.168.1.10(PC0) Source**

**IP Address: 198.168.1.20(PC1)**

After NAT TRANSLATION

**Source IP Address:200.200.200.2(for both PC)**

### Key Learning:

1. NAT Translates Private IPs to Public IPs
- 2.The router must have a default route (0.0.0.0/0) pointing to the ISP gateway (201.20.20.5).Without this, internet-bound packets won't know where to go.
3. NAT Requires Proper Configuration & ACLs.We must define inside (ip nat inside) and outside (ip nat outside) interfaces. An ACL (Access Control List) is needed to specify which traffic gets translated.
4. Use ping to test connectivity at each step (PC → Router → ISP → Internet).
5. Commands like show ip nat translations and show ip route help diagnose issues.