CSE 3502

INFORMATION SECURITY MANAGEMENT

Lab Assessment – 2

L19+L20 | SJT516
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by

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Exp 2. Part 1: Cisco Router Show Commands

1.1. INTRODUCTION

- Cisco routers run an operating system, called IOS (Internetwork Operating System). Like any operating system, IOS includes a command language to enable equipment owners to retrieve information and change the device's settings.

- A large number of commands are available on Cisco routers, as well as many different protocols and features that can be used to establish a network.

- The following commands are used to gather information on a Cisco IOS Software-based router when attempting to learn basic information about a router, or possibly troubleshooting protocol-independent problems:
    - show version
    - show running-config
    - show interfaces
    - show logging
    - show tech-support

- One of the most powerful commands in IOS is `show`. This command retrieves information and can be used to examine nearly everything about a Cisco router and its configuration. This part of the assignment revolves around exploring router with the `show` commands.

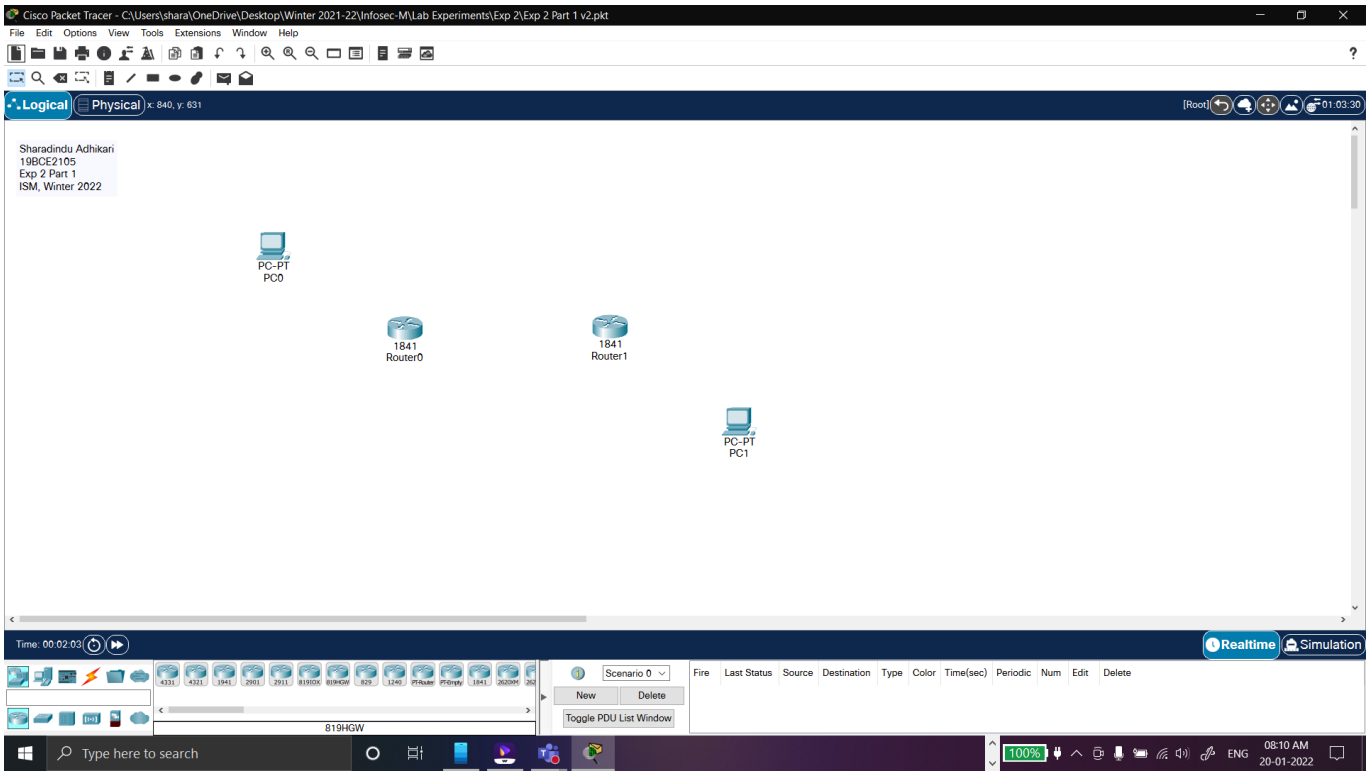
1.2. COMPONENTS

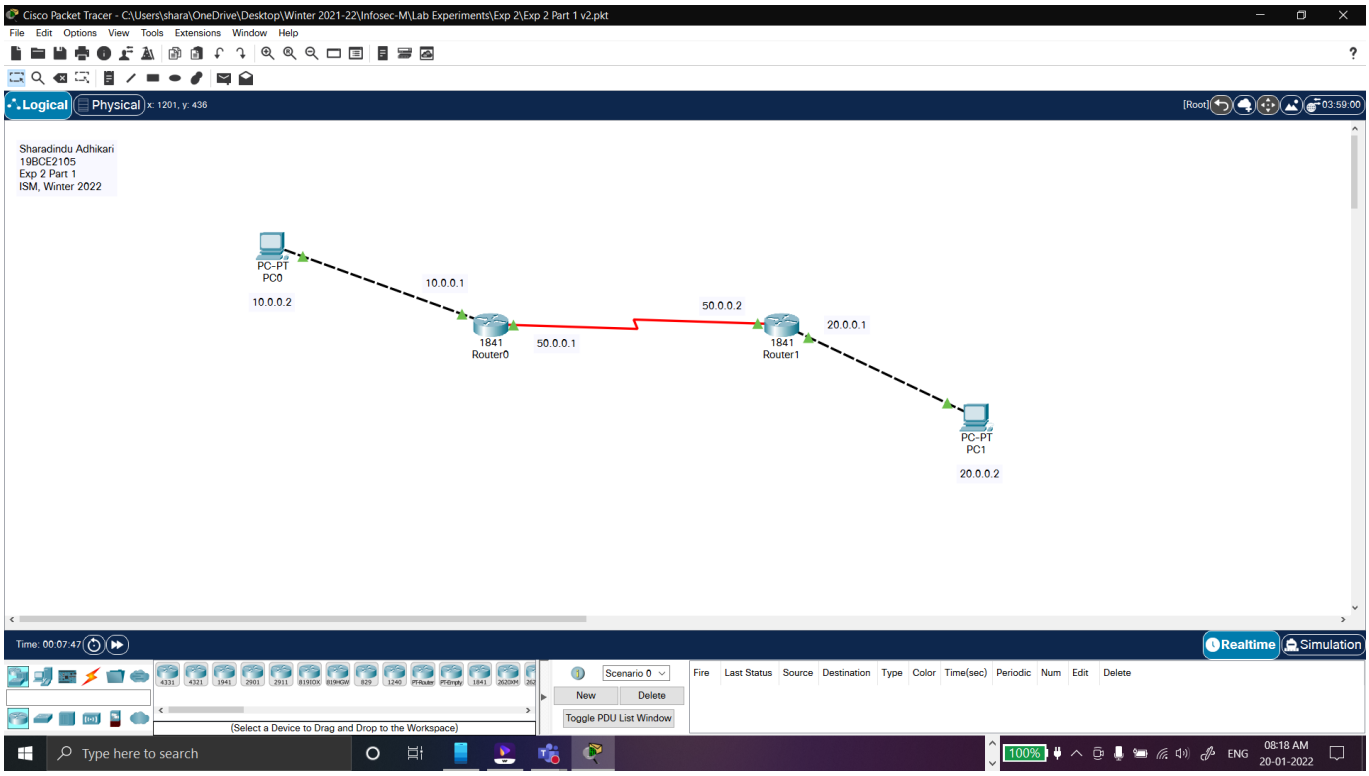
Component / Device / Interface	Connected To	IP Address
PCs		
PC0	FastEthernet0/0 of Router0	10.0.0.2 / 255.0.0.0
PC1	FastEthernet0/0 of Router 1	20.0.0.2 / 255.0.0.0
Routers		
Router0 (FastEthernet0/0)	PC0	10.0.0.1 / 255.0.0.0
Router0 (Serial0/0/0)	Serial0/0/0 of Router1	50.0.0.1 / 255.0.0.0
Router1 (Serial0/0/0)	Serial0/0/0 of Router0	50.0.0.2 / 255.0.0.0
Router 1 (FastEthernet0/0)	PC1	20.0.0.1 / 255.0.0.0

- PC-PTs and 1841 Routers are the only components here.
- RIP Routing Protocol is configured on both routers 0 and 1.
- Clock rate and bandwidth is assigned on the Serial Interface 0/0/0 of Router0.

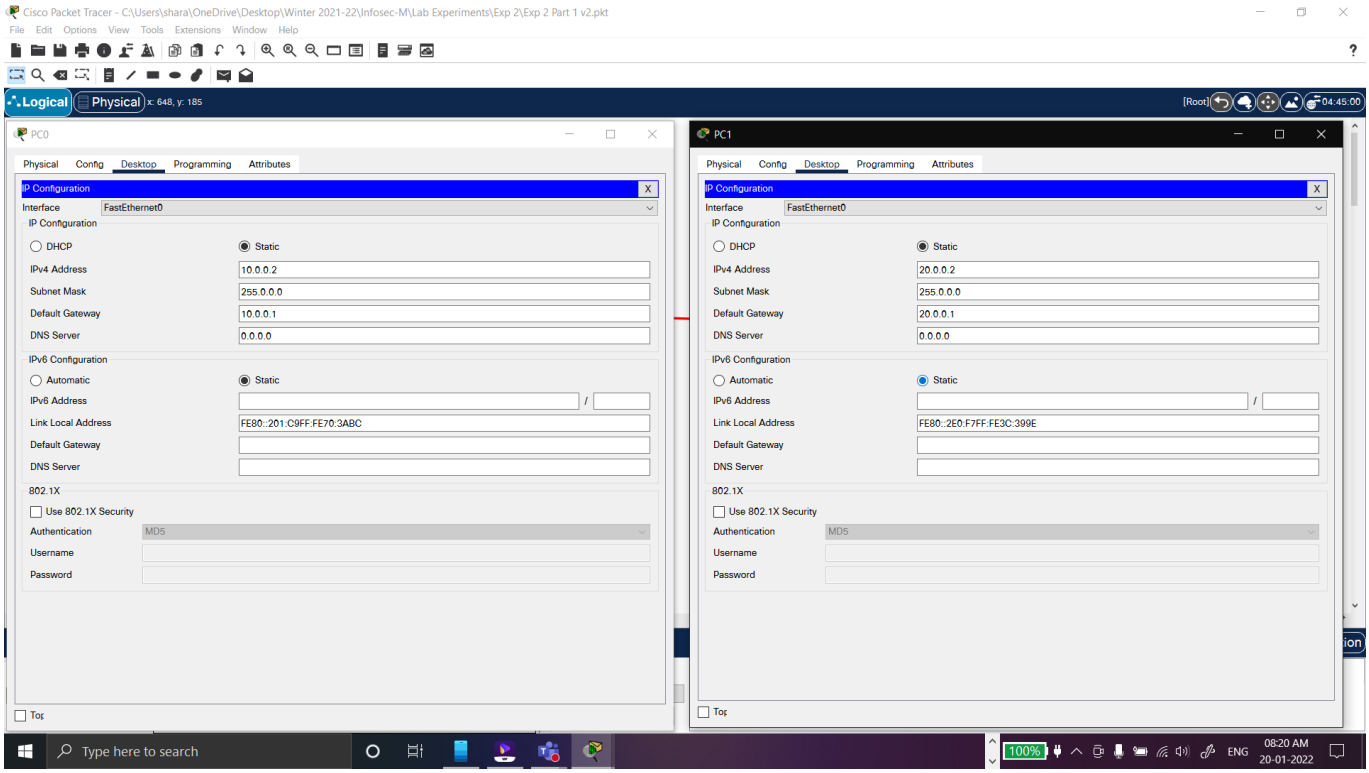
1.3. SNAPSHOTS & COMMANDS

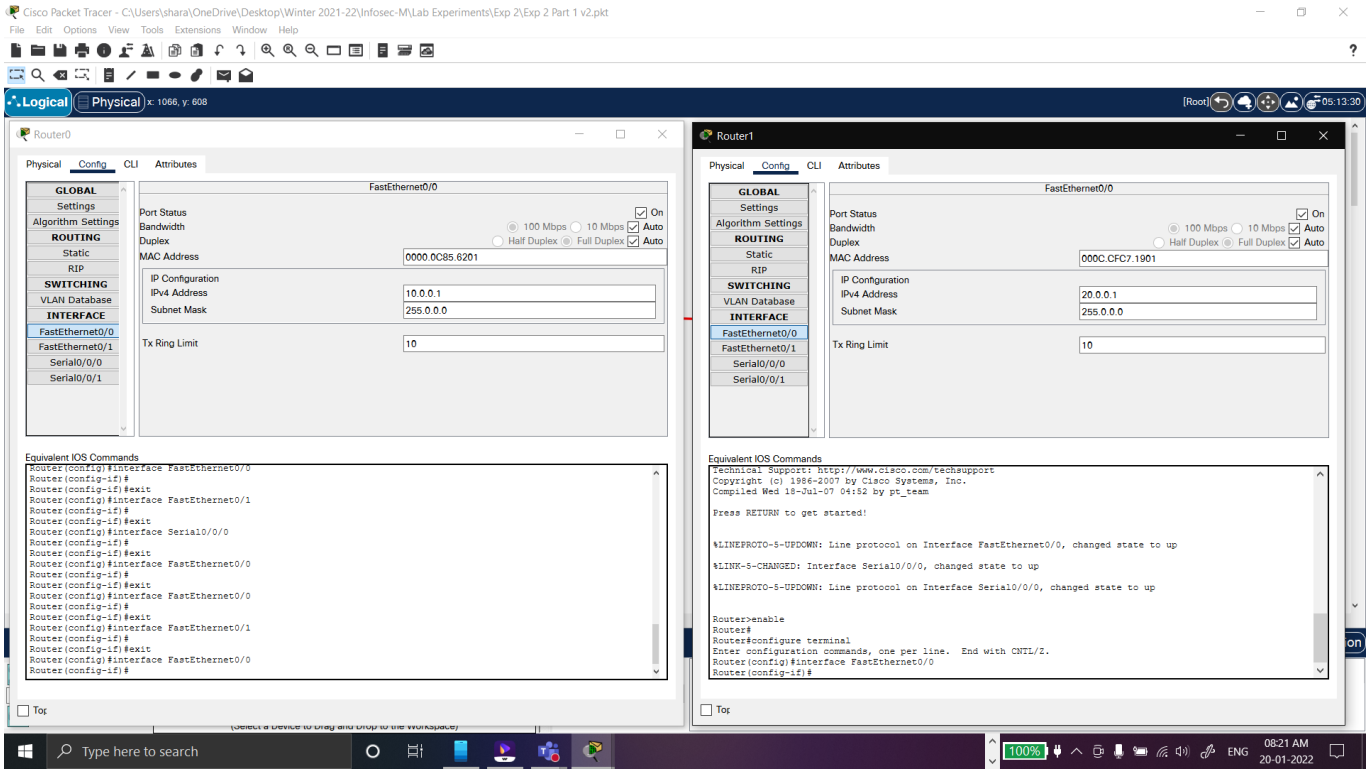
Step 1: Making the Topology

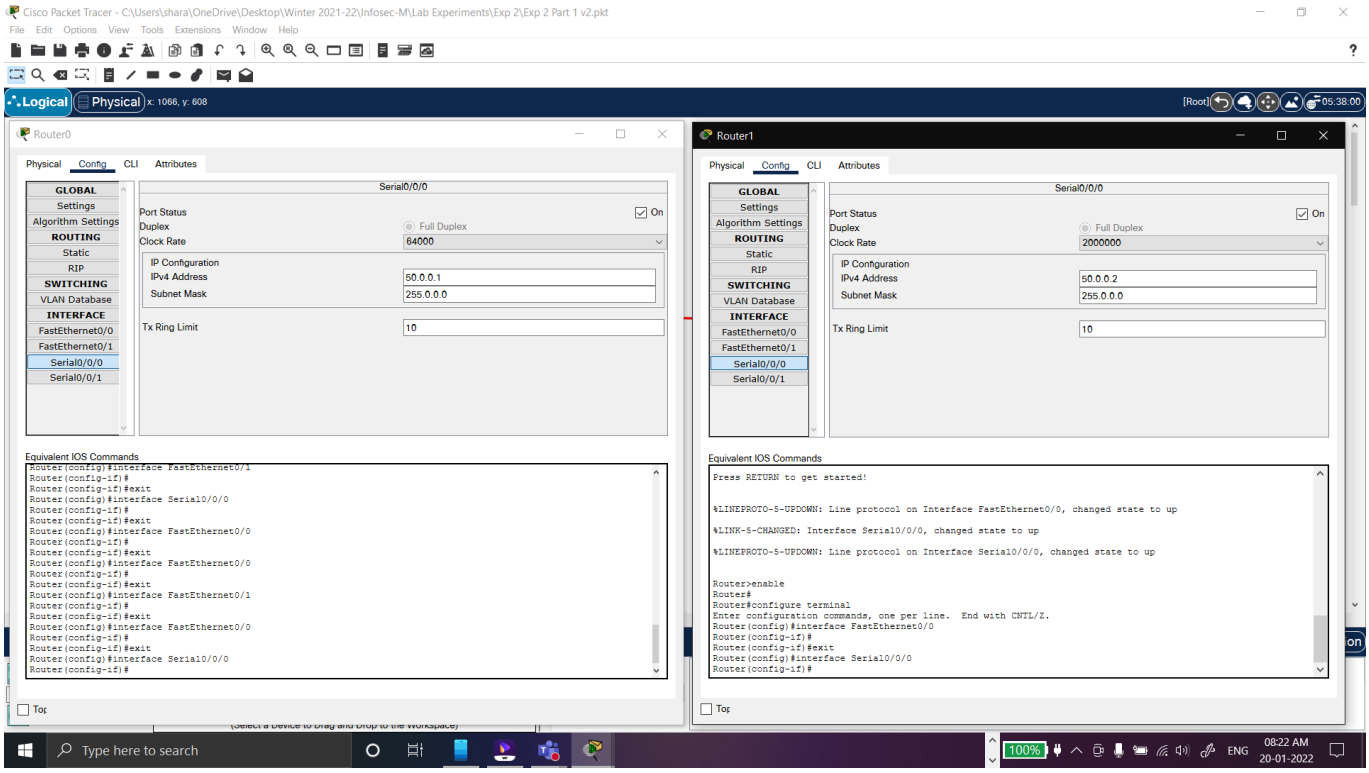


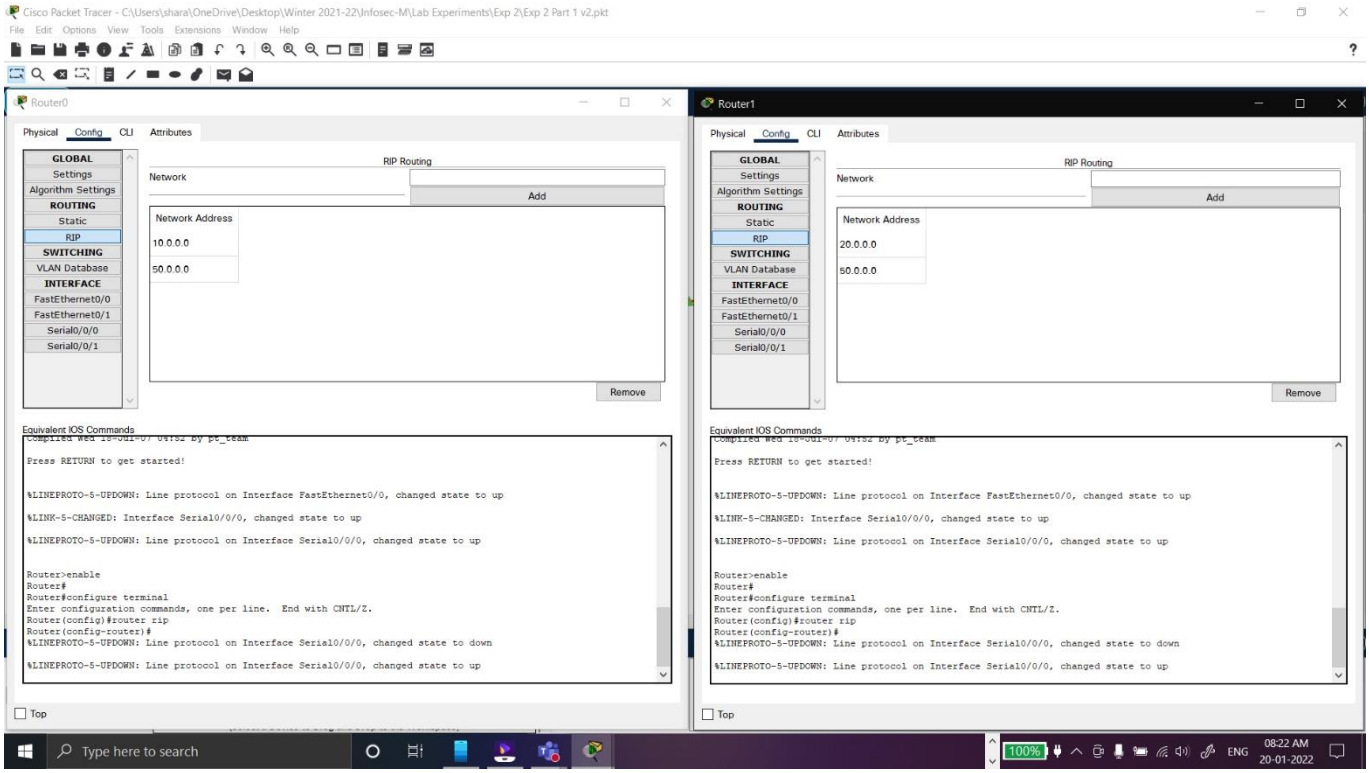


Step 2: Assigning the IPs and Configuring









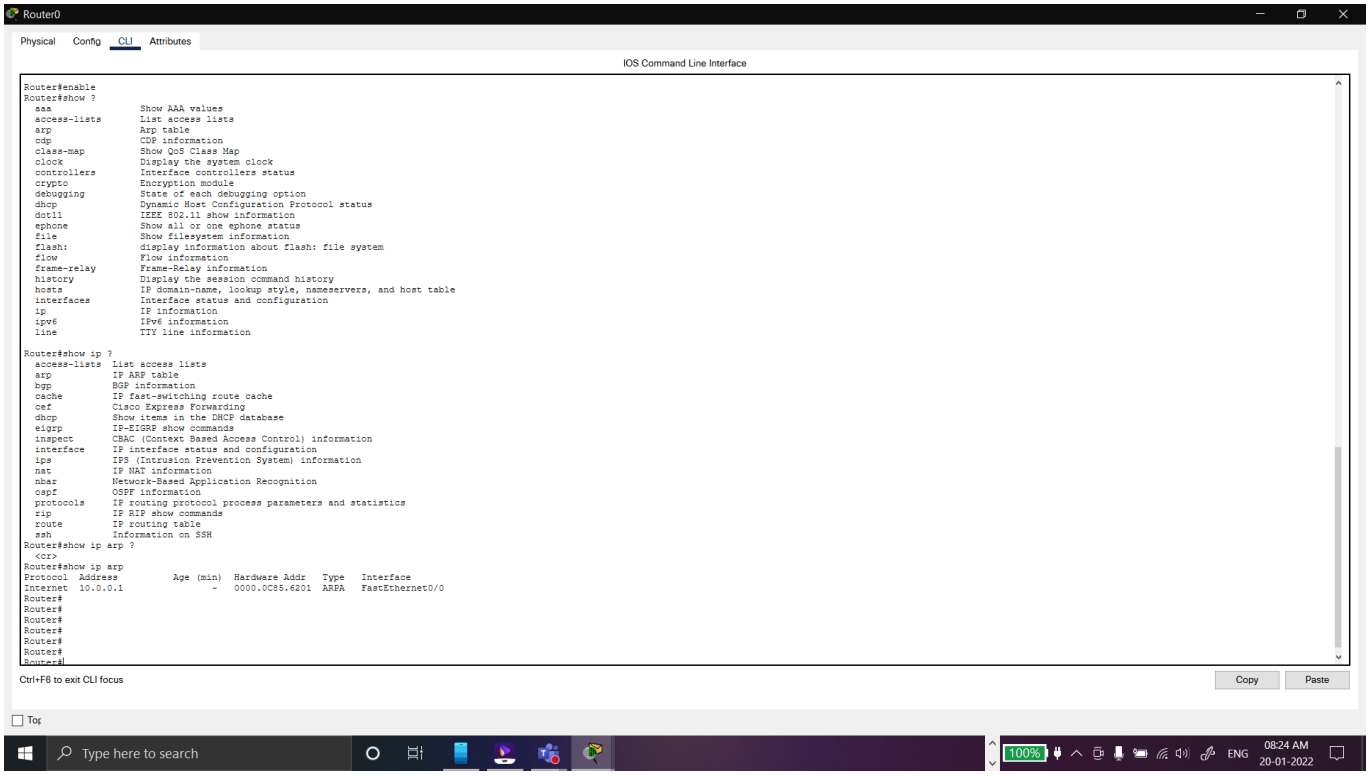
<u>Step 3</u>: Cisco Router Show Commands

First, we type in the `enable` command to enter in privilege exec mode. Then use the `show` command, paired with `?` (Question mark) to list all available commands.

Router#show ip

To display IP configuration data, enter the show ip command in User Exec mode or Privileged Exec mode.

```
Router#show ip [address-table | route | http [server secure]]
```



Router#show interfaces

This command shows the status and configuration of interfaces. By default, it will display all interfaces. But we can limit it to particular interface. To view the detail of specific interface we can use the following command:

```
Router#show interface [type slot_# port_#]
```

For example, to view the detail of serial 0/0/0 interface on Router0, we will use the following command:

```
Router#show interface serial 0/0/0
```

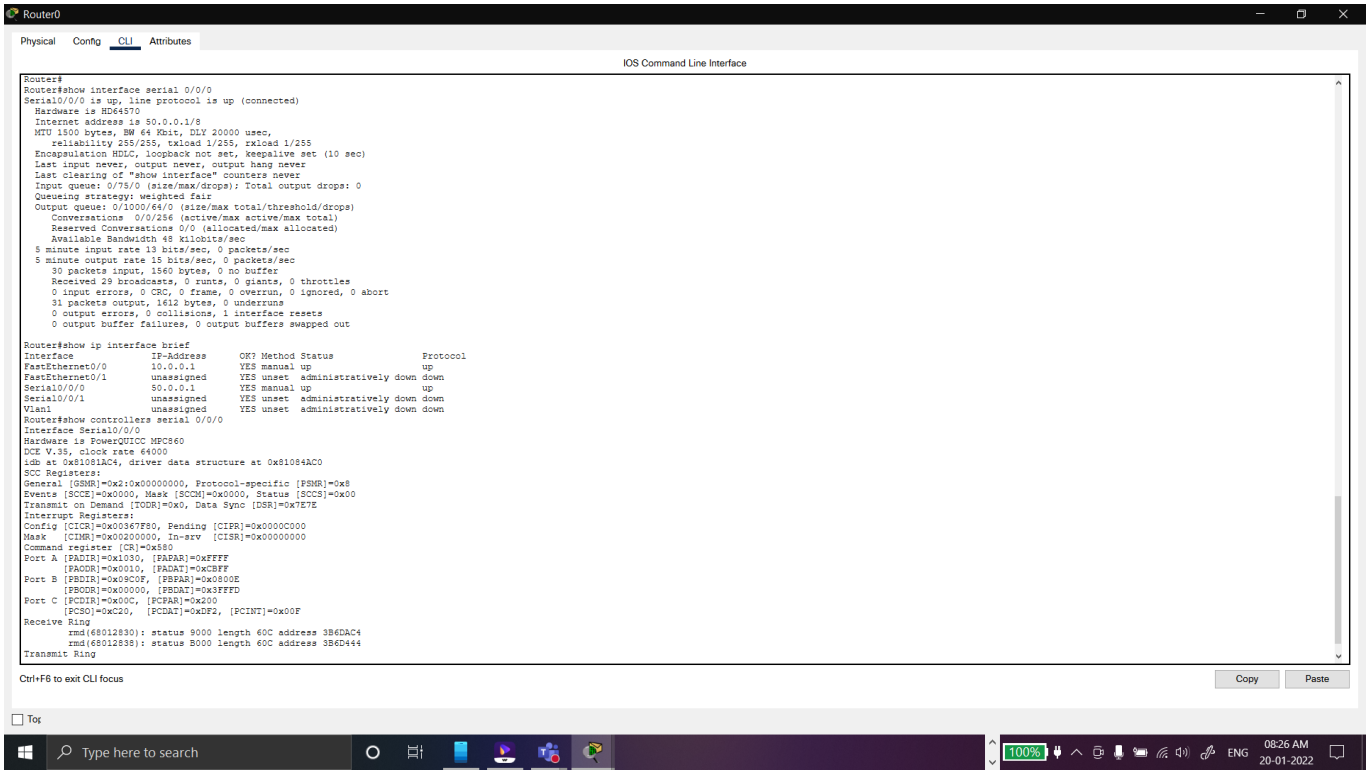
Router#show ip interface brief

This command provides a quick overview of all interfaces on the router including their IP addresses and status.

Router#show controllers [type slot_# port_#]

This command is used to check the hardware statistic of interface including clock rate and cable status such as cable is attached or not. One end of serial cable is physically DTE, and the other end is DCE. If cable is attached, it will display the type of cable.

For example, `Router#show controllers serial 0/0/0`



Router#show flash

This command displays the content of flash memory, used space and available space. By default, router stores IOS image file in flash. We can use this command to check the available space in Flash memory while updating / restoring IOS files.

Router#show version

This command displays information about software version of running IOS. It also provides information about configuration setting. It shows current configuration register setting that is used to reset the password of router.

Router#show hosts

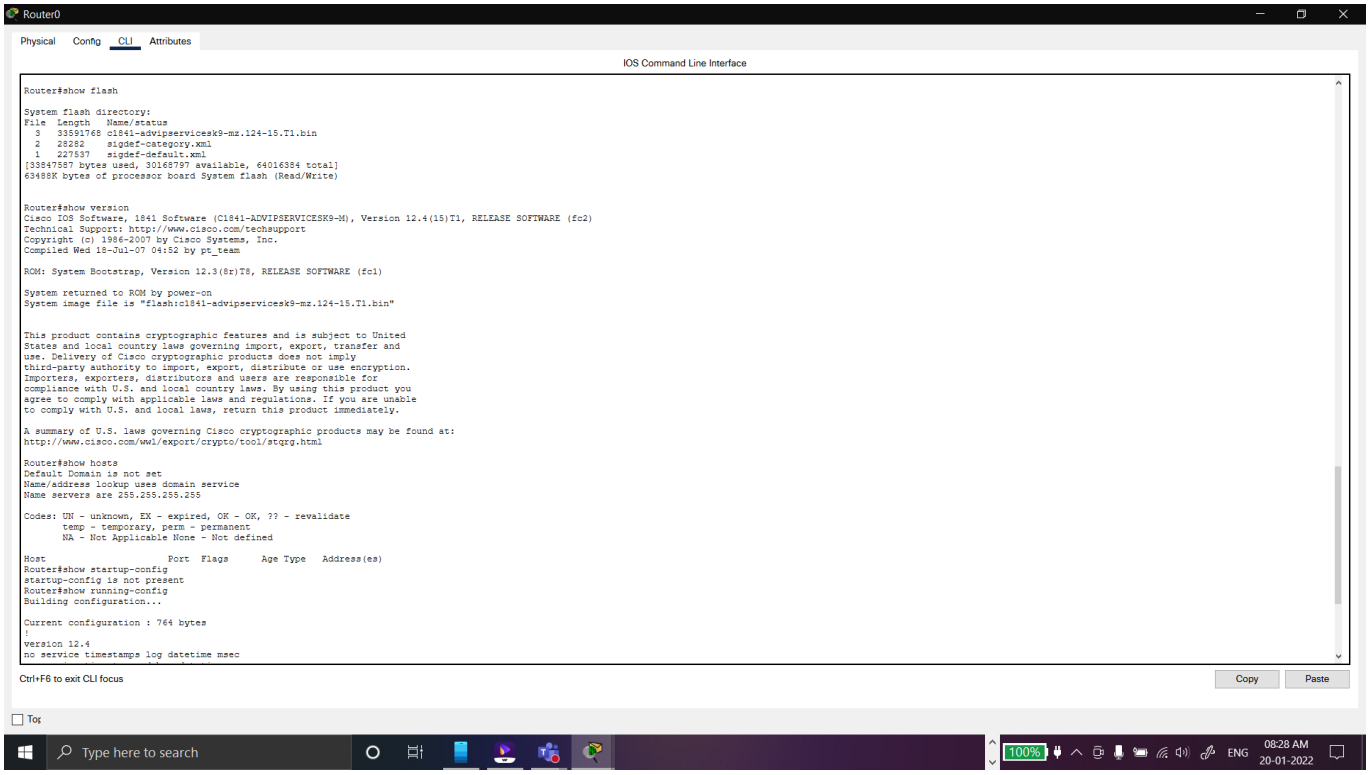
To display the DNS name servers and domain name that our Server Switch uses, we enter the `show host` command in User Exec mode or Privileged Exec mode. This command has no arguments or keywords.

Router#show startup-config

Routers load configuration from NVRAM in start-up. This command will display the configuration stored in NVRAM.

Router#show running-config

Router keeps all running configuration in RAM. This command will display the configuration currently running in RAM.



Router#show clock

To display the current system time, we enter the `show clock` command in User Exec mode or Privileged Exec mode.

Router#show users

This command displays users currently connected to the router.

Router#show arp

This command displays ARP cache table. ARP table is used to resolve the hardware MAC addresses.

Router#show protocols

This command shows the status of configured layer three protocols on the device.

Router#show history

Router keeps a history of used command. This command will list the used command on that level.

Router#show ip route

Routers use routing table to take packet forward decision. This command displays routing table.

Router0

Physical Config CLI Attributes

IOS Command Line Interface

```
!
ip cef
no ipv6 cef
!
!

Router#show clock
*0:17:54.532 UTC Mon Mar 1 1993
Router#show users
    Line       User       Host(s)              Idle       Location
*   0 con 0                idle                 00:00:00

  Interface    User               Mode         Idle     Peer Address
Router#show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.0.0.1               -   0000.0C85.6201  ARPA   FastEthernet0/0
Router#show protocols
Global values:
  Internet Protocol routing is enabled
FastEthernet0/0 is up, line protocol is up
  Internet address is 10.0.0.1/8
FastEthernet0/1 is administratively down, line protocol is down
Serial0/0/0 is up, line protocol is up
  Internet address is 50.0.0.1/8
Serial0/0/1 is administratively down, line protocol is down
Vlan1 is administratively down, line protocol is down
Router#
Router#
Router#show history
  show flash
  show version
  show hosts
  show startup-config
  show running-config
  show clock
  show users
  show arp
  show protocols
  show history
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 50.0.0.2, 00:00:15, Serial0/0/0
C    50.0.0.0/8 is directly connected, Serial0/0/0

Router#
```

Ctrl+F6 to exit CLI focus

Copy Paste

Top

Type here to search

100% ENG 08:31 AM 20-01-2022

Exp 2. Part 2: Static NAT Configuration

2.1. INTRODUCTION

- A static network address translation (static NAT) is a type of NAT technique that routes and maps network traffic from a static public IP address to an internal private IP address and/or network. It enables providing external network or Internet connectivity to computers, servers or networking devices within a private local area network (private LAN) having an unregistered private IP address.

- A static NAT is primarily used in enterprise networks where many internal servers have unregistered IP addresses and are accessed by a global audience using static public IP addresses. It provides a means to ensure network transparency, security and privacy by hiding the details of internal network usage, architecture and patterns from external or public users.

- A static NAT works by creating a one-to-one relationship between the public and private IP address. This means the private IP address can be mapped to only one public IP address at a time. The end user, on the other hand, has a transparent view of the remote device/network and accesses it using the mapped public IP address.

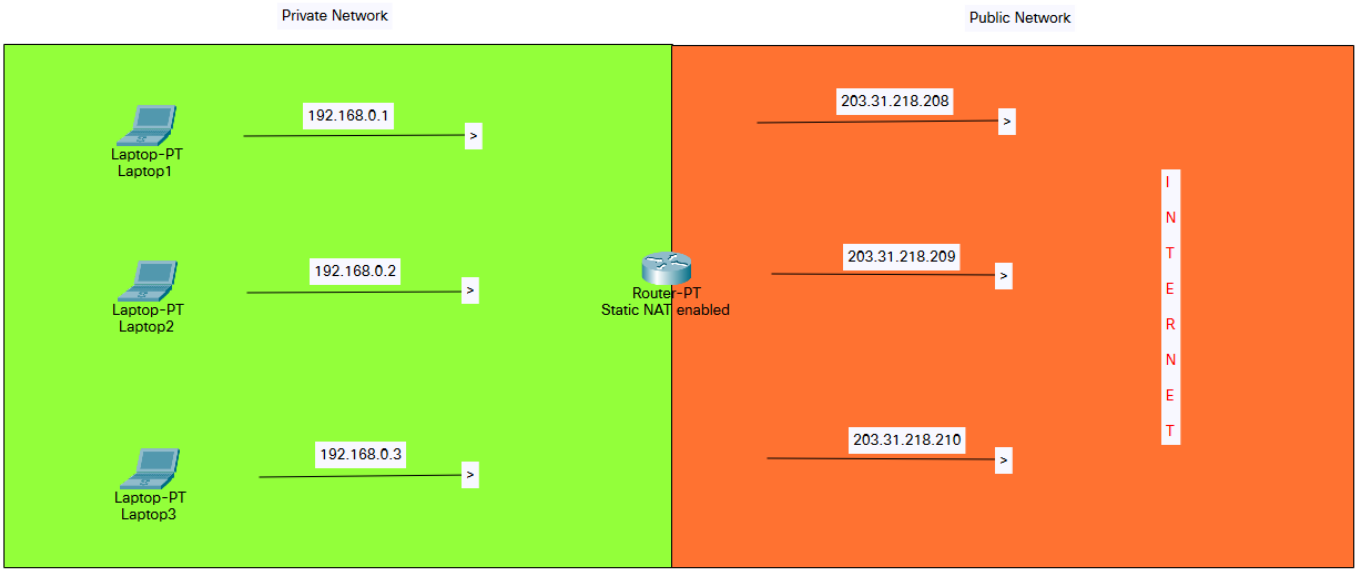
- Static NAT allows connections to be originated from either side of the network, but translation is limited to one-to-one or between blocks of addresses of the same size. For each private address, a public address must be allocated. No address pools are necessary.

- Static Network Address Translation (NAT) rules specify two layers of match conditions:
  - Traffic direction — Allows you to specify from interface, from zone, or from routing-instance.
  - Packet information — Can be source addresses and ports, and destination addresses and ports.

- Static NAT also supports the following types of translation:
  - To map multiple IP addresses and specified ranges of ports to a same IP address and different range of ports.
  - To map a specific IP address and port to a different IP address and port.

- All IP translations take place within the router's memory and the whole process is totally transparent to both internal and external hosts. When hosts from the Internet try to contact the internal hosts, their packets will either be dropped or forwarded to the internal hosts depending on the router's & firewall configuration.

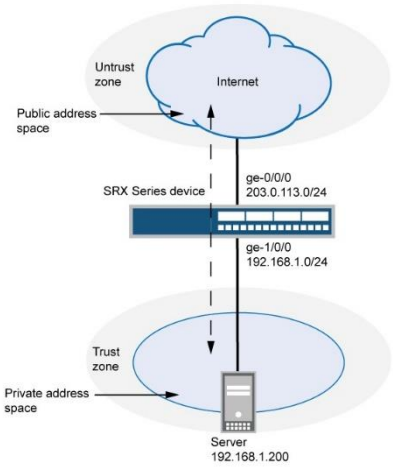
- In the diagram below, made in Packet Tracer, we can see that we have our private network connected to the Internet via our router, which has been configured for Static NAT mode. In this mode each private host has a single public IP Address mapped to it, e.g., private host 192.168.0.1 has the public IP Address 203.31.218.208 mapped to it. Therefore, any packets generated by 192.168.0.1 that need to be routed to the Internet will have their source IP field replaced with IP Address 203.31.218.208.



- The main configuration tasks for static NAT are as follows:
  - Configure static NAT rules that align with your network and security requirements.
  - Configure NAT proxy ARP entries for IP addresses in the same subnet of the ingress interface.

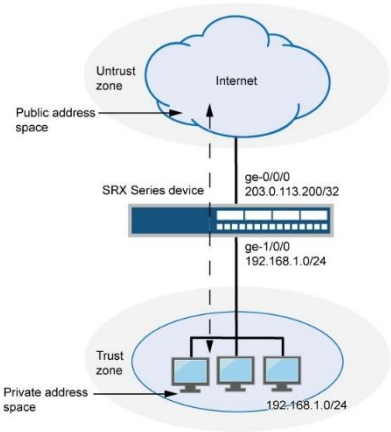
- **Static NAT Config. for**

Single Address Translation



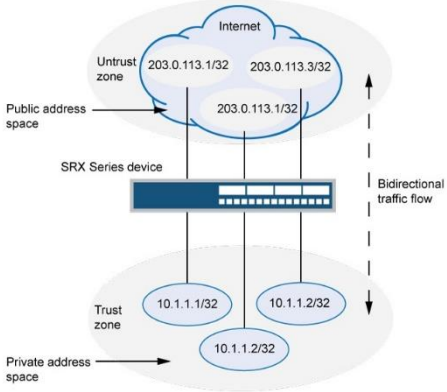
Original Destination IP	Translated Destination IP
203.0.113.200/32	192.168.1.200/32

Subnet Translation



Original Destination IP	Translated Destination IP
203.0.113.200/32	192.168.1.0/24

Port Mapping



Original Source IP	Translated Source IP
203.0.113.1/32 (port 100 to 200) 203.0.113.1/32 (port 300 to 400) 203.0.113.3/32 (port 300)	10.1.1.1/32 (port 300 to 400) 10.1.1.2/32 (port 300 to 400) 10.1.1.2/32 (port 200)

- Because static NAT rules do not support overlapping addresses and ports, they should not be used to map one external IP address to multiple internal IP addresses for ALG traffic. For example, if different sites want to access two different FTP servers, the internal FTP servers should be mapped to two different external IP addresses.

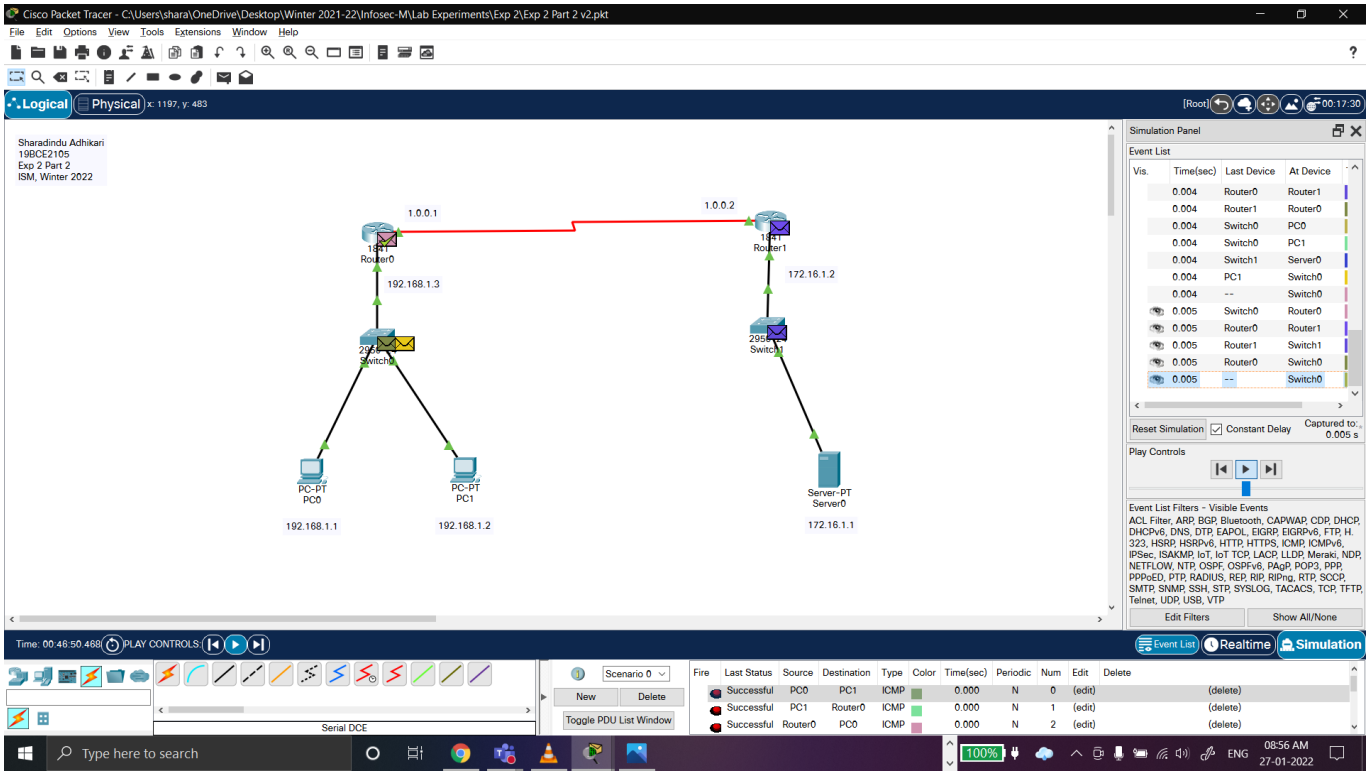
2.2. COMPONENTS

Component / Device / Interface	IP Address	Connected with
PCs		
PC0 (Fa0)	192.168.1.1	Fa0/0 of Router0
PC1 (Fa0)	192.168.1.2	Fa0/0 of Router0
Routers		
Router0 (Se0/0/0)	1.0.0.1	Se0/0/0 of Router1
Router1 (Se0/0/0)	1.0.0.2	Se0/0/0 of Router0
Server		
Server0 (Fa0)	172.16.1.1	Fa0/0 of Router1

- The Components in this Part are the regular PC-PTs, 1841 Routers, 2950-24 Switches, and a Server.
- After assigning IPs to all the components (switches being the obvious exception), and configuring the Routers, Static NAT has been configured.
- All the commands are added separately (from the snapshots) as well, along with their descriptions where necessary.

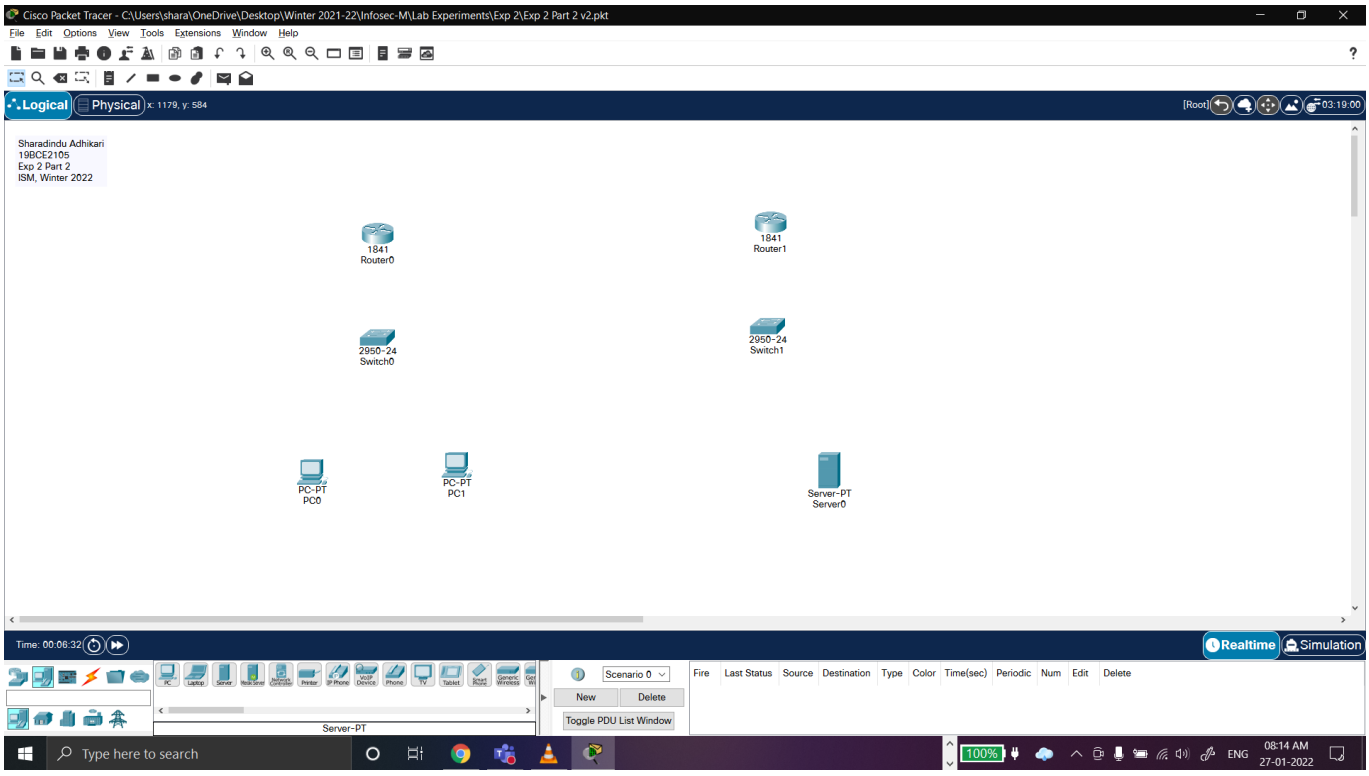
2.3. DIAGRAM

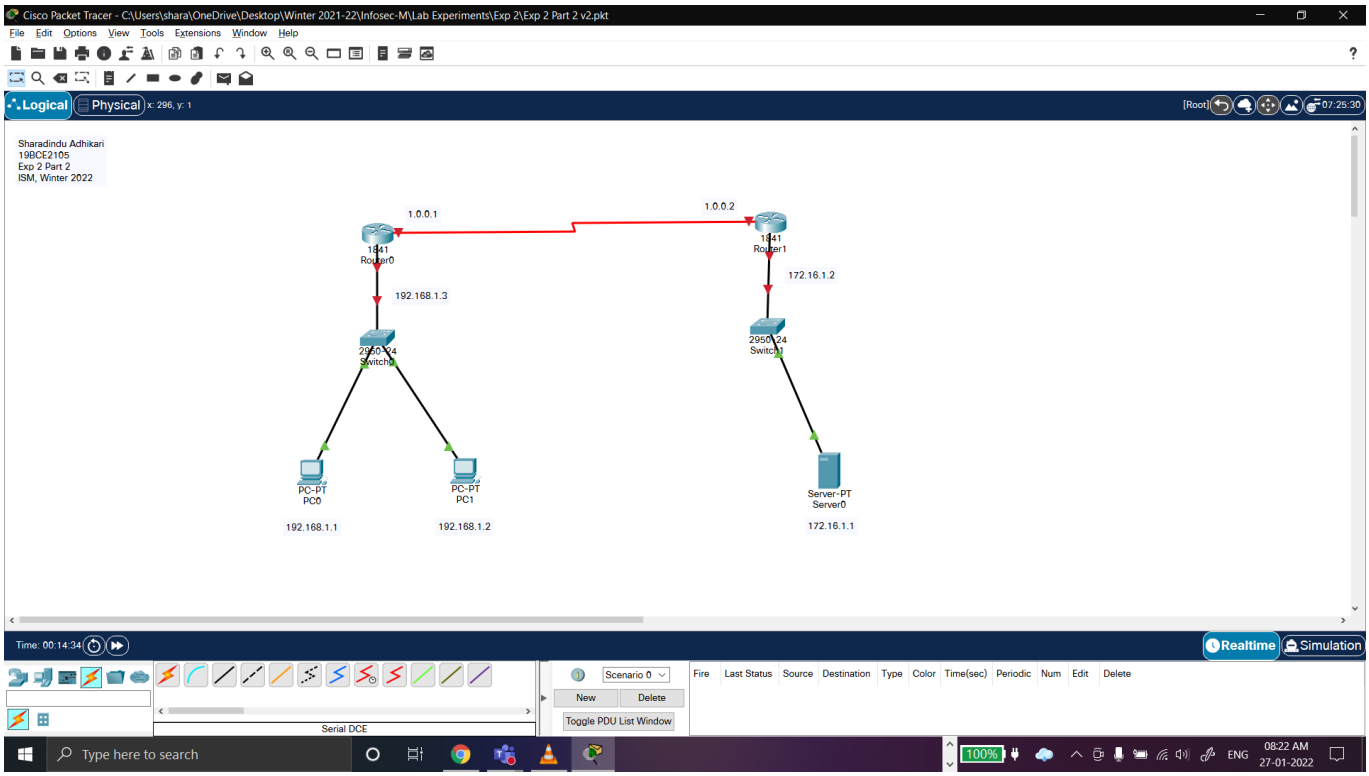
Final Simulation of the entire static NAT setup:



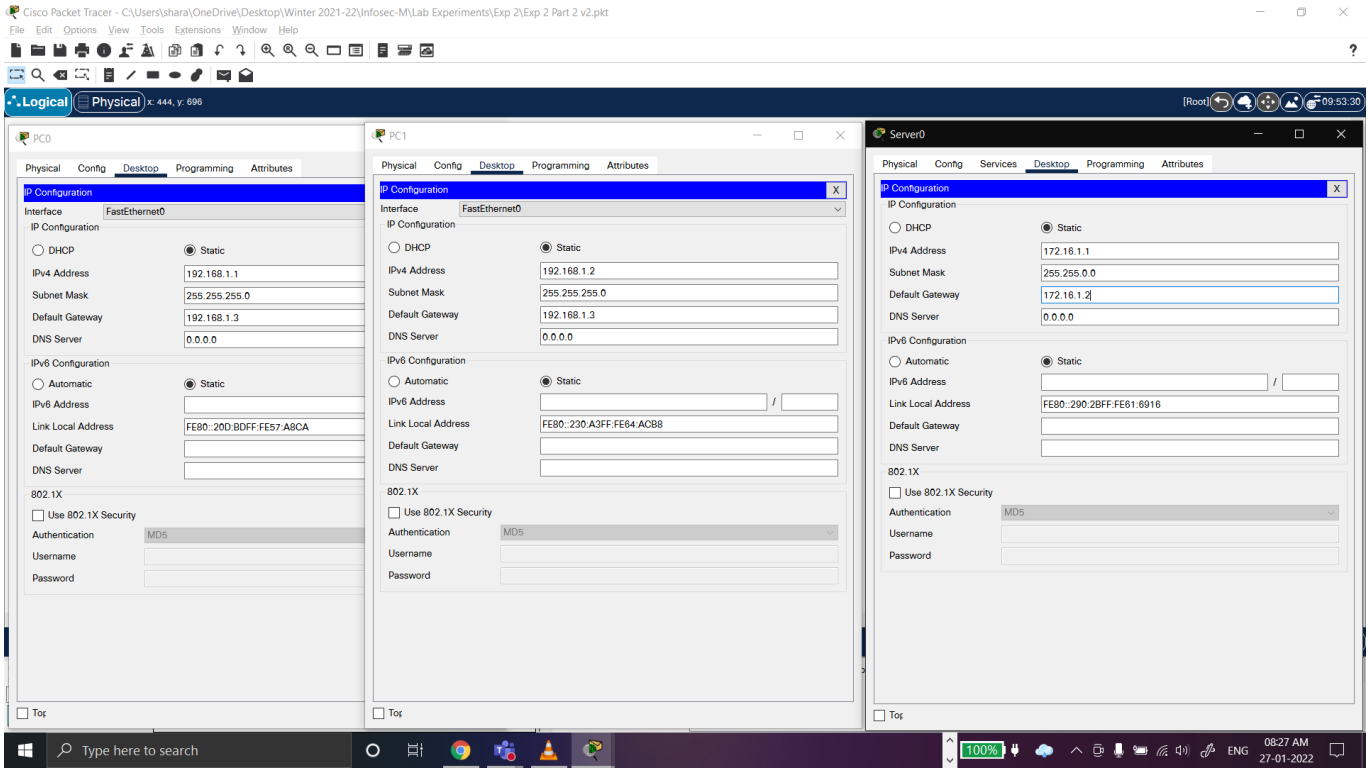
2.4. COMMANDS AND SCREENSHOTS

Step 1: Making the Topology





Step 2: Assigning IP Addresses to the PCs and the Server



Step 3: Configuring IP Addresses in the Routers (using CLI)

Router0

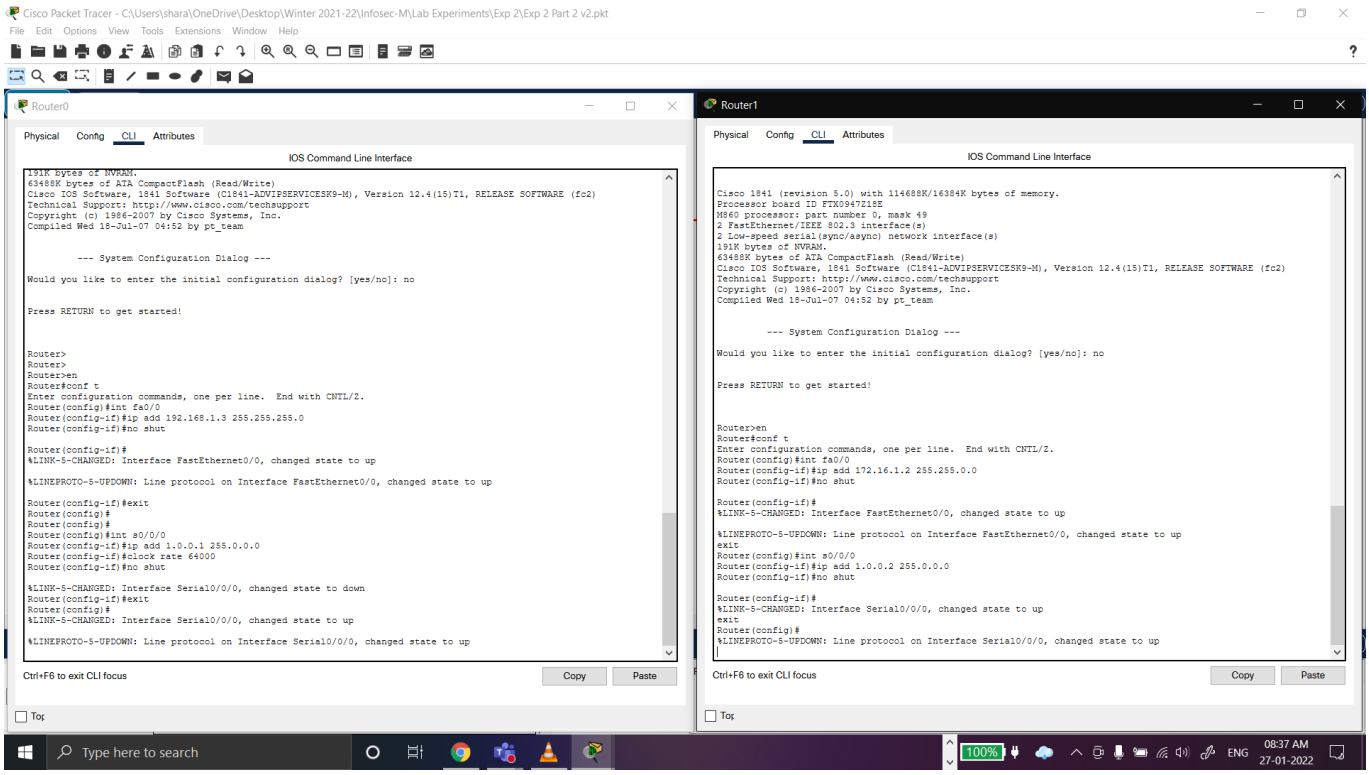
```
Router>en
Router#conf t
Router (config)#int fa0/0
Router (config-if)#ip add 192.168.1.3 255.255.255.0
Router (config-if)#no shut
Router (config-if)#exit

Router (config)#int s0/0/0
Router (config-if)#ip add 1.0.0.1 255.0.0.0
Router (config-if)#clock rate 64000
Router (config-if)#no shut
Router (config-if)#exit
```

Router1

```
Router>en
Router#conf t
Router (config)#int fa0/0
Router (config-if)#ip add 172.16.1.2 255.255.0.0
Router (config-if)#no shut
Router (config-if)#exit
```

```
Router (config)#int s0/0/0
Router (config-if)#ip add 1.0.0.2 255.0.0.0
Router (config-if)#no shut
Router (config-if)#exit
```



Descriptions with example IP addresses:

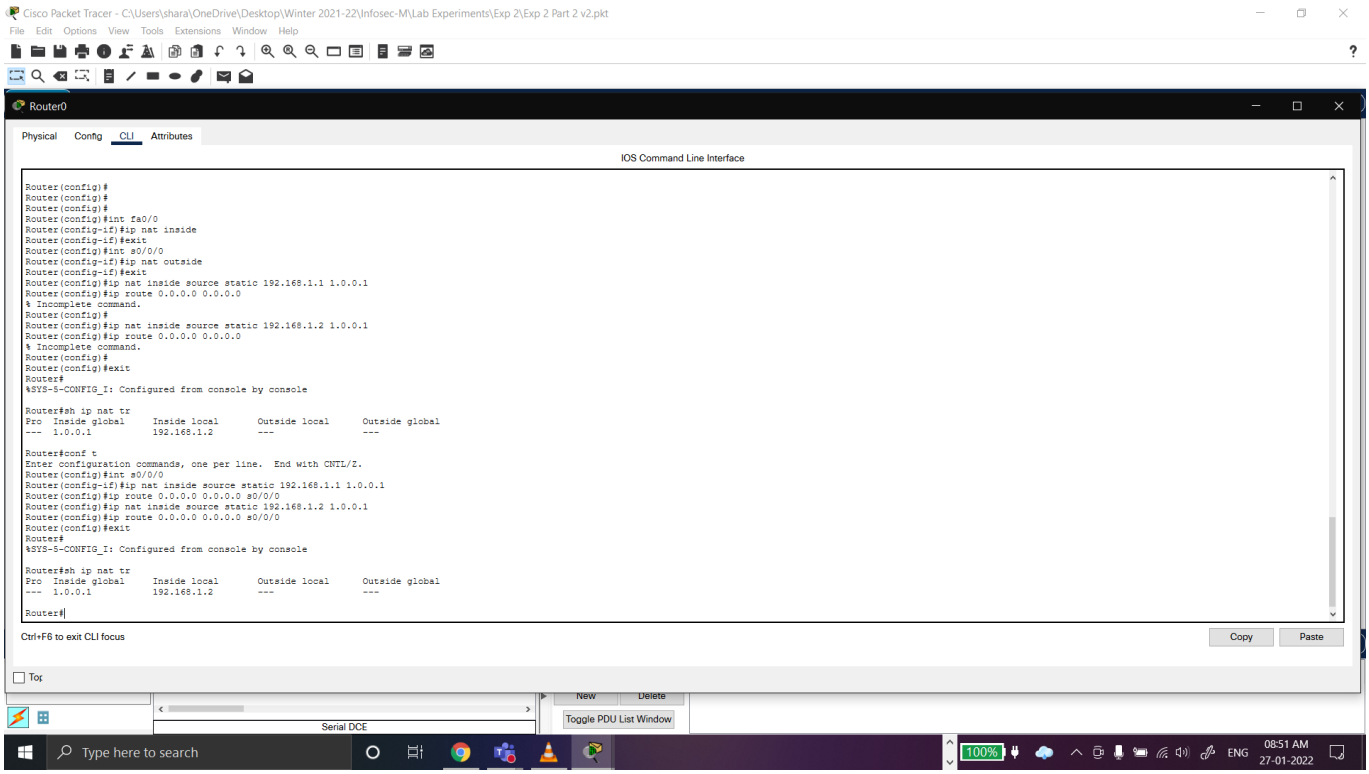
- `interface FastEthernet 0/0` command is used to enter in interface mode.
  `ip address 10.0.0.1 255.0.0.0` command assigns IP address to interface.
  `no shutdown` command is used to bring the interface up.
  `exit` command is used to return in global configuration mode.

- `Router(config)#interface serial 0/0/0` command is used to enter in interface mode.
  `Router(config-if)#ip address 100.0.0.1 255.0.0.0` command assigns IP to interface.
  `Router(config-if)#no shutdown` command brings interface up.
  `Router(config-if)#exit` command is used to return in global configuration mode.

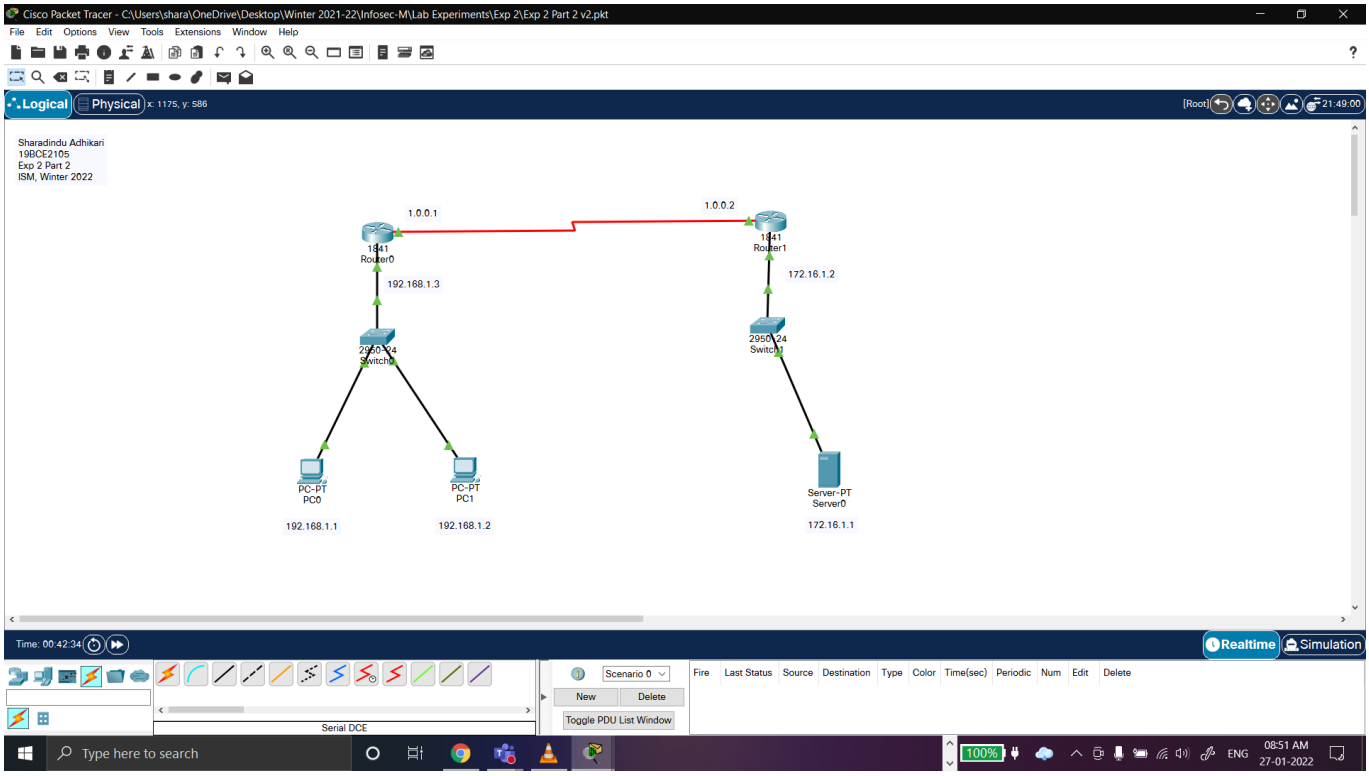
<u>Step 4</u>: Configuring Static NAT

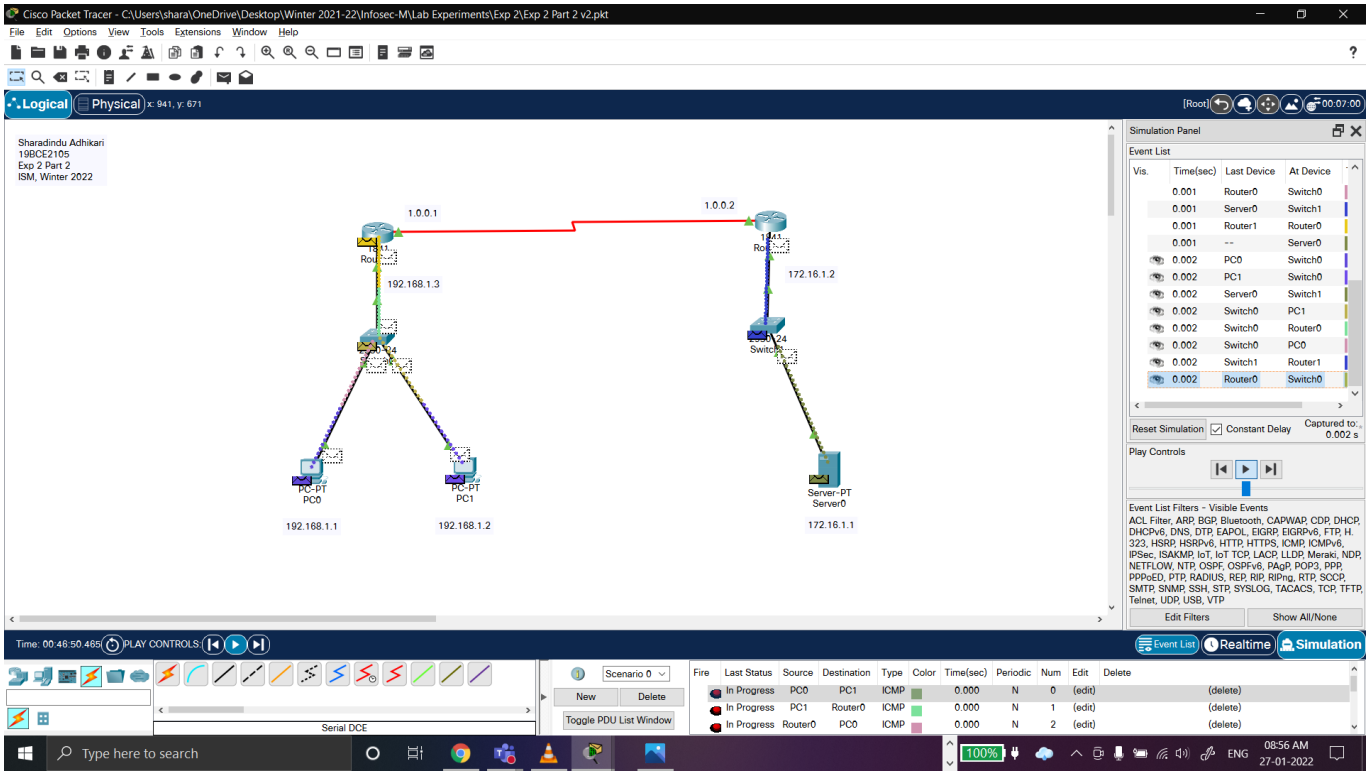
```
Router (config)#int fa0/0
Router (config-if)#ip nat inside
Router (config-if)#exit
Router (config)#int s0/0/0
Router (config-if)#ip nat outside
Router (config-if)#exit
Router (config)#ip nat inside source static 192.168.1.1 1.0.0.1
Router (config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
Router (config)#ip nat inside source static 192.168.1.2 1.0.0.1
Router (config)#ip route 0.0.0.0 0.0.0.0 s0/0/0
Router (config)#exit
```

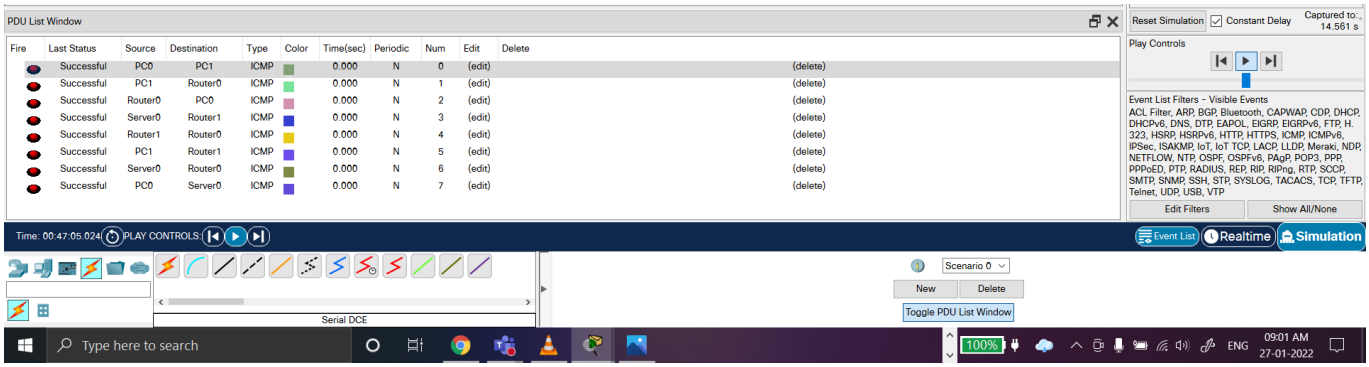
```
Router#
Router#sh ip nat tr
Pro   Inside global    Inside local     Outside local    Outside global
---   1.0.0.1          192.168.1.2      ---              ---
Router#
```



Step 5: Sending PDUs, Simulating the route, etc.




Cisco Packet Tracer - C:\Users\shara\OneDrive\Desktop\Winter 2021-22\Infosec-M\Lab Experiments\Exp 2\Exp 2 Part 2 v2.pkt
File Edit Options View Tools Extensions Window Help
Logical
Physical
Sharadindu Adhikari
19BCE2105
Exp 2 Part 2
ISM, Winter 2022
1.0.0.1
1.0.0.2
192.168.1.3
172.16.1.2
PC-PT PC0
PC-PT PC1
Server-PT Server0
192.168.1.1
192.168.1.2
172.16.1.1
Simulation Panel
Event List
Vis. Time(sec) Last Device At Device
0.001 Router0 Switch0
0.001 Server0 Switch1
0.001 Router1 Router0
0.001 -- Server0
0.002 PC0 Switch0
0.002 PC1 Switch0
0.002 Server0 Switch1
0.002 Switch0 PC1
0.002 Switch0 Router0
0.002 Switch0 PC0
0.002 Switch1 Router1
0.002 Router0 Switch0
Reset Simulation
Constant Delay
Play Controls
Edit Filters
Show All/None
Time: 00:46:50.465
PLAY CONTROLS:
Event List
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete
In Progress PC0 PC1 ICMP 0.000 N 0 (edit) (delete)
In Progress PC1 Router0 ICMP 0.000 N 1 (edit) (delete)
In Progress Router0 PC0 ICMP 0.000 N 2 (edit) (delete)
Serial DCE
Type here to search
08:56 AM
27-01-2022


PDU List Window
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete
Successful PC0 PC1 ICMP 0.000 N 0 (edit) (delete)
Successful PC1 Router0 ICMP 0.000 N 1 (edit) (delete)
Successful Router0 PC0 ICMP 0.000 N 2 (edit) (delete)
Successful Server0 Router1 ICMP 0.000 N 3 (edit) (delete)
Successful Router1 Router0 ICMP 0.000 N 4 (edit) (delete)
Successful PC1 Router1 ICMP 0.000 N 5 (edit) (delete)
Successful Server0 Router0 ICMP 0.000 N 6 (edit) (delete)
Successful PC0 Server0 ICMP 0.000 N 7 (edit) (delete)
Reset Simulation
Constant Delay
Play Controls
Edit Filters
Show All/None
Time: 00:47:05.024
PLAY CONTROLS:
Event List
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Serial DCE
Type here to search
09:01 AM
27-01-2022