Experiment - 5

Aim:-
Implementation and understanding the use of DNAT & PAT with Cisco Packet Tracer.

Objectives - 1:-
An overview of DAT (Dynamic Network Address Translation) and PAT (Port Address Translation).

DAT (Dynamic Network Address Translation):-

a) Many to many mapping b/w multiple private IPv4 address and public IPv4 address.
b) A pool of public IPv4 address are assigned to the private IPv4 address on a first come first server basis.
c) If there are 6 public IPv4 addresses within the pool and there are 50 devices on the internal n/w, then only a maximum of 6 devices can use the available public IPv4 addresses at a time.
d) If a 7th device wants to communicate over the internet, the device will need to wait until one of the public IPs address is made available by the router.

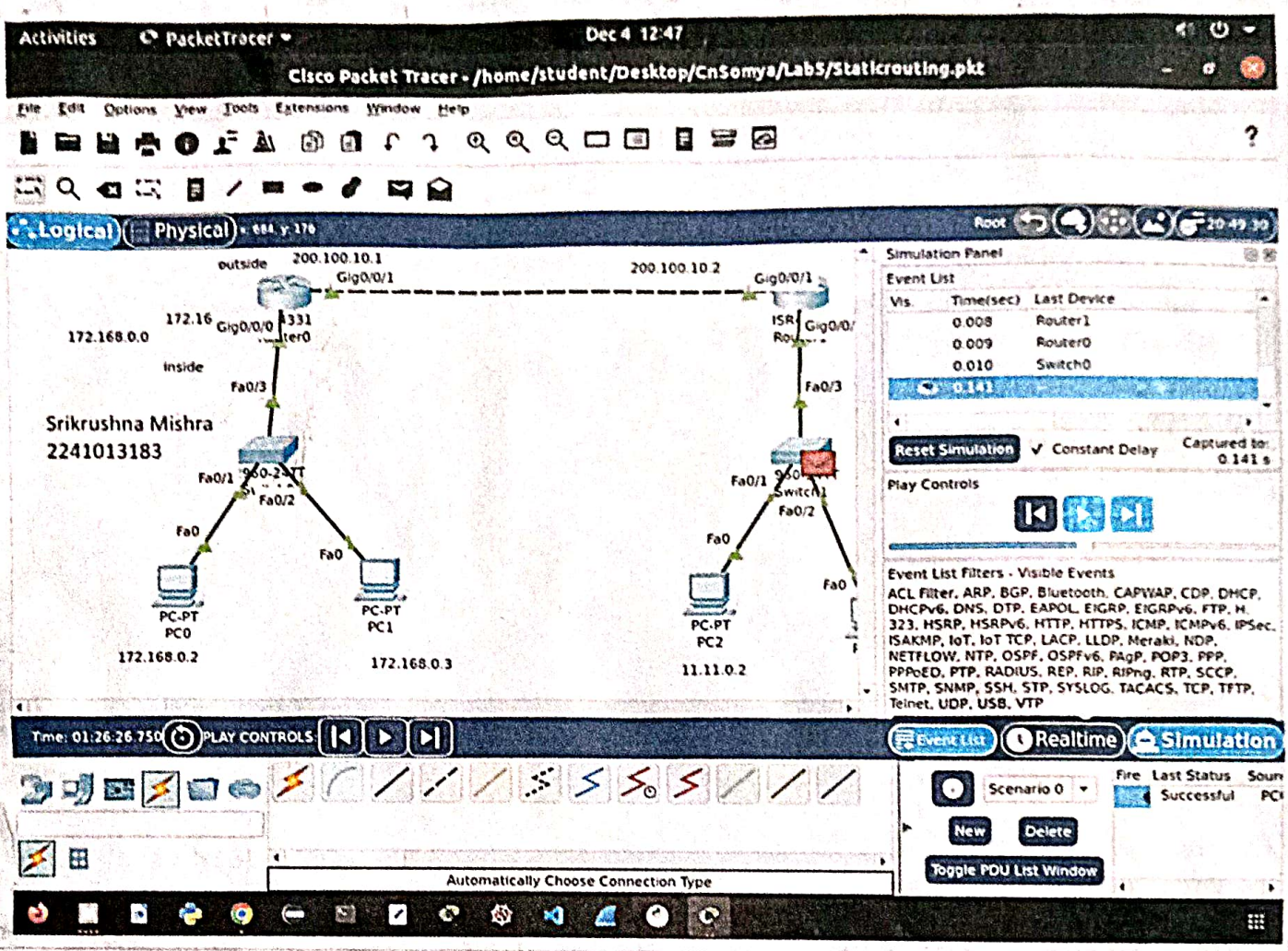
PAT (Post Address Translation):-

a) Also called as NAT overload.
b) It is the most common type of NAT
c) Performs many to one translation.
d) Allows multiple devices with private IPv4 address on the internal network to translate their source address to a single public IPv4 address using NAT router or modem.
e) It includes source and destination service port number of each communication.
f) Using the source & destination service port number allows the NAT router or modem to uniquely identify and ~~talk~~ track each communication b/w the inside and outside network.

Name:_____ Regd. Number:_____

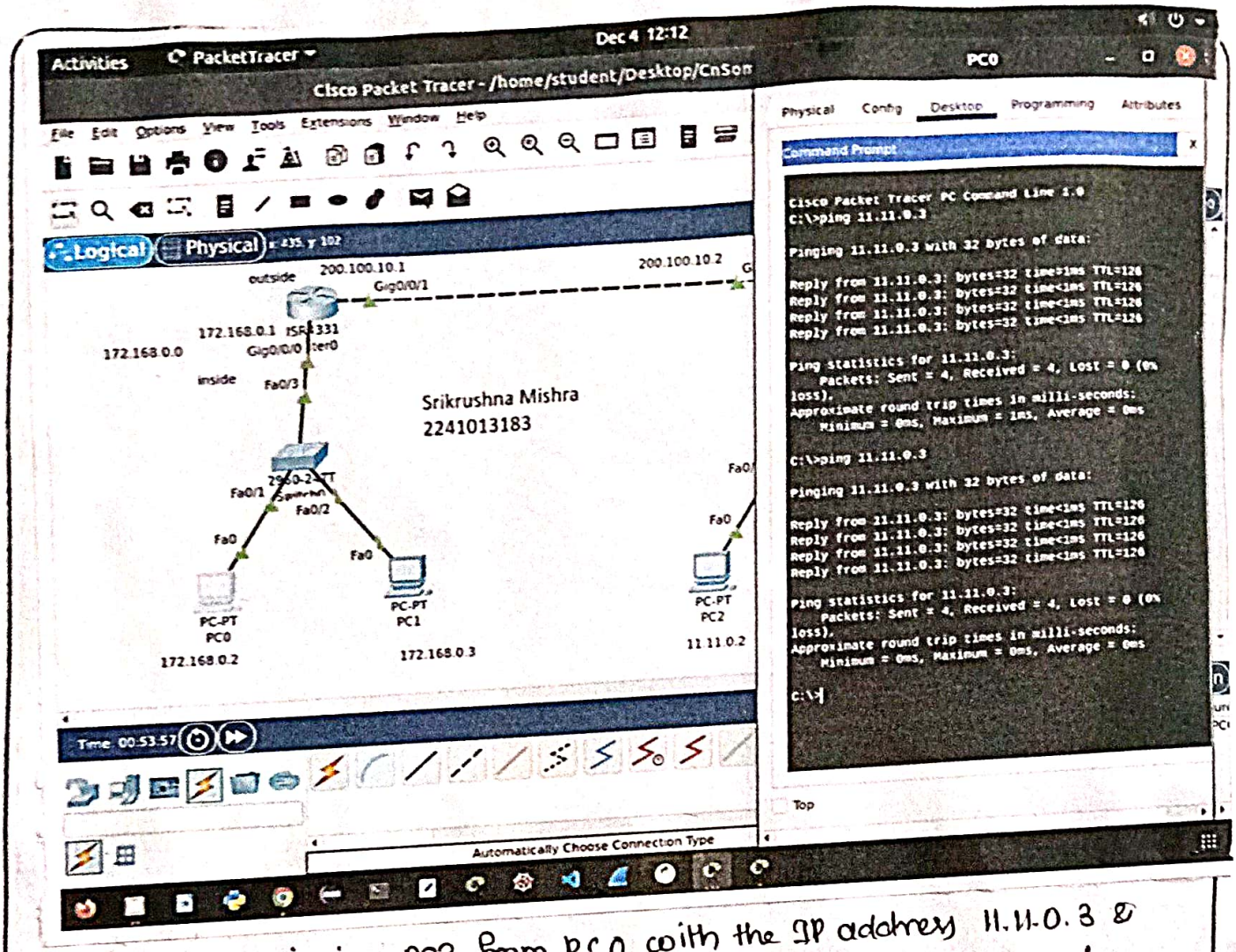
Objective-2

Configuring & implementing DAT using a router to analyse the communication bkw PCs (in a private network) & public server.



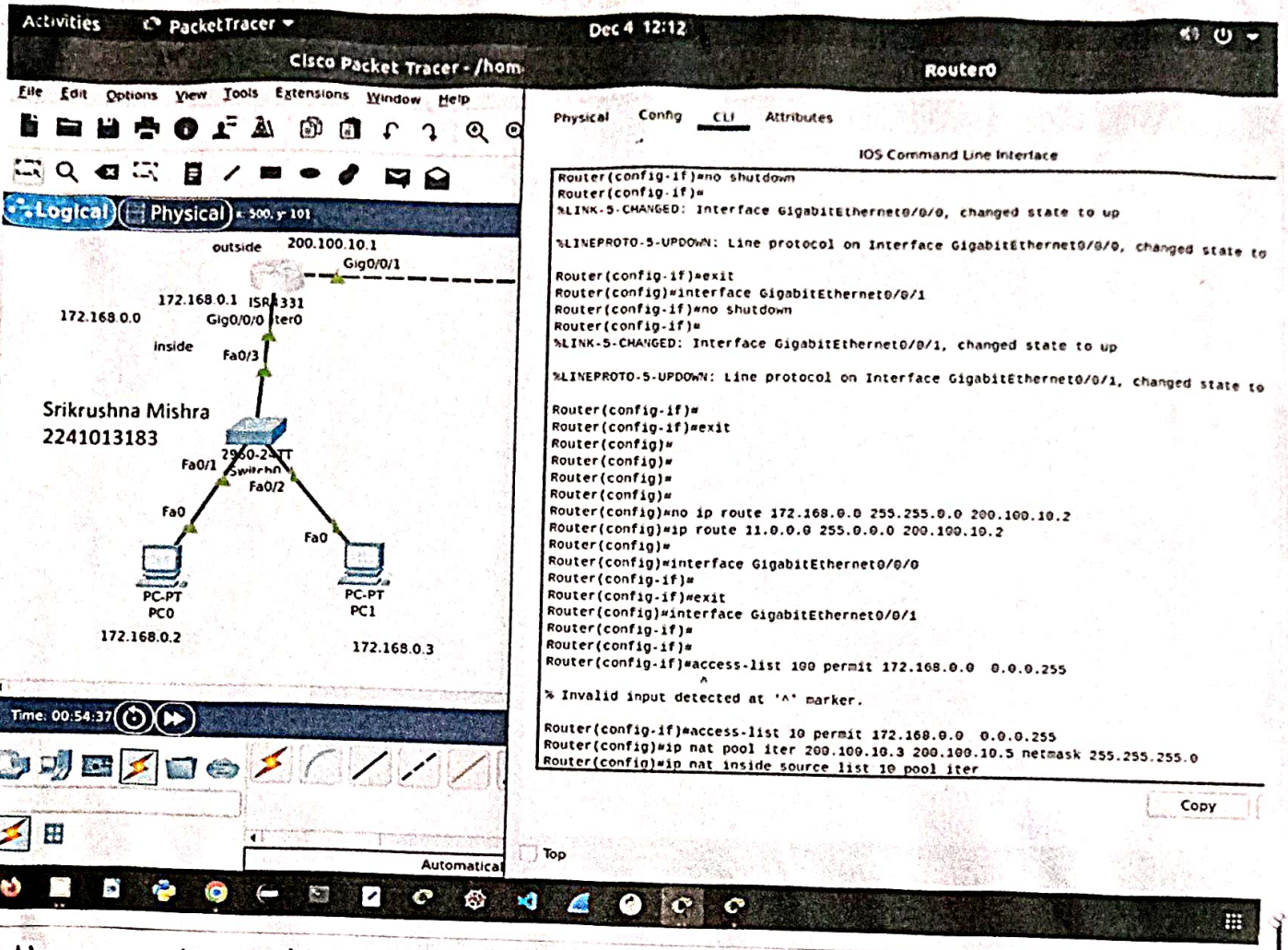
Source	Destination	
PC0	PC2	ICMP message was partial success from PC0 to PC2 after doing dynamic NAT

Name:———— Regd. Number:————



→ Here, we are pinging PC3 from PC0 with the IP address 11.11.0.3 & here 4 packets are being sent and 4 packets are recieved respectively, i.e. our dynamic routing is correct.

Name:_____ Regd. Number:_____

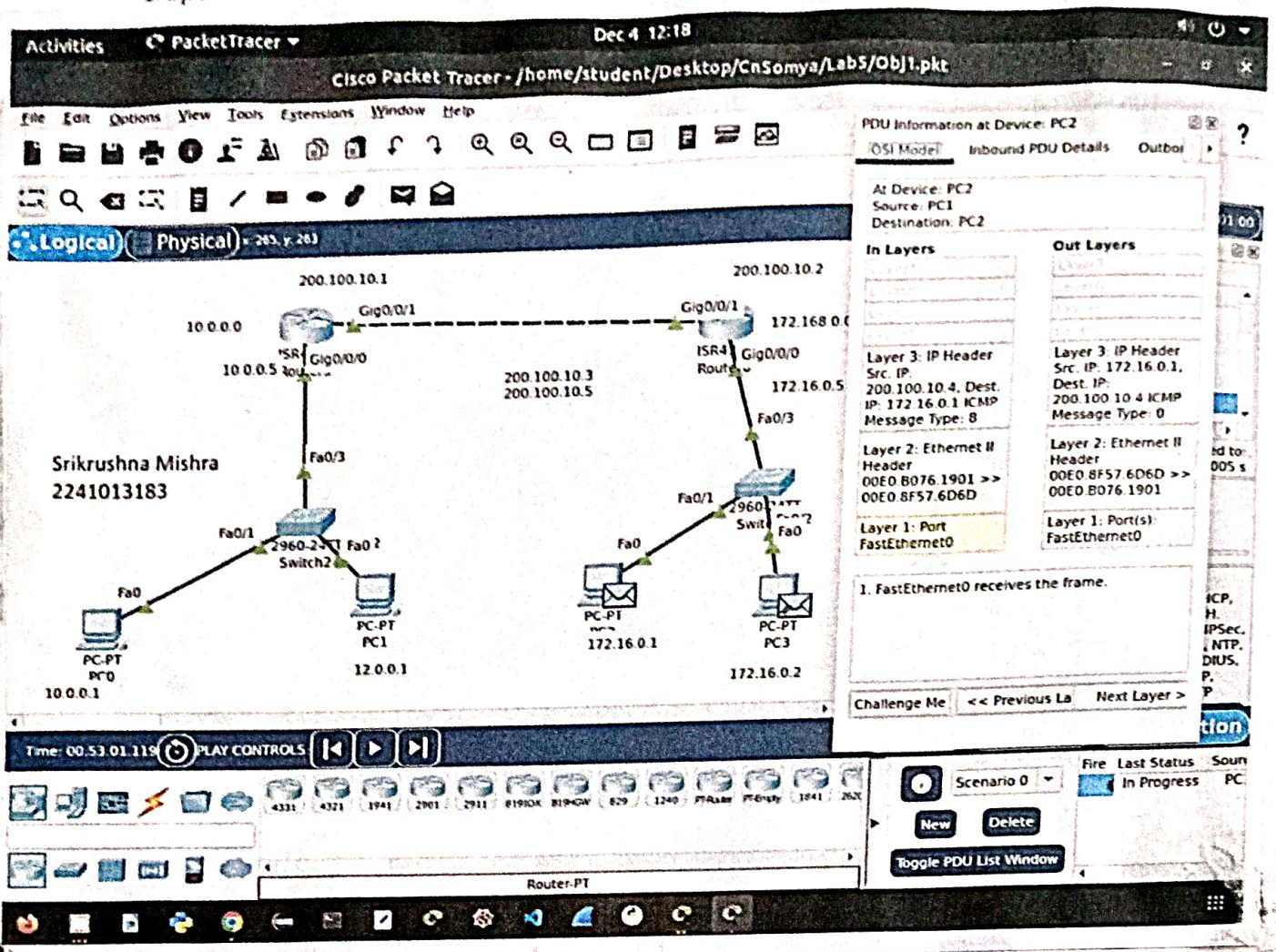


⇒ Here, we have to create a pool of IP address from 192.168.3.3 to 192.168.3.5

⇒ For that, we made Gig0/0/0 as inside NAT of router 0 and Gig0/0/1 as outside NAT (of router 0)

→ Now, we have to convert Router 0 in a dynamic NAT having a pool of IP address, which are on public networks and will be converted into private networks.

Name:_____ Regd. Number:_____



Source — PC1

Destination — PC2

An ICMP message was passed from PC1 to PC2

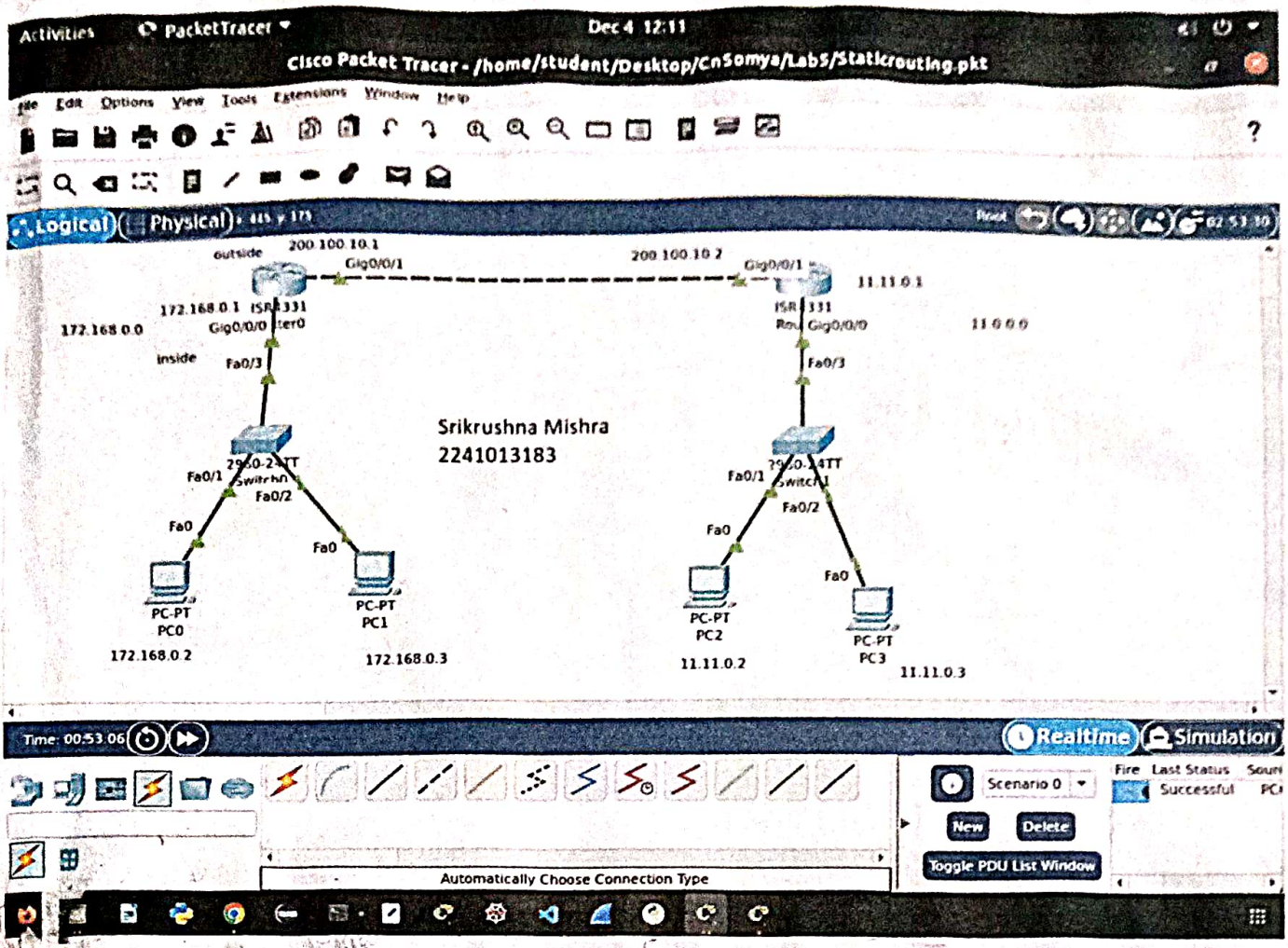
→ This is the PDU information on the first instance when the message reached PC2; at this moment, PC2 has not sent any acknowledgement to PC1

→ Inside inlayer destruction IP is 10.10.1.3, which is the address of PC2

Objective-3:-

Configuring and implementing PAT using a router to analyse the communication between PCs (in a private network) and a PCs in a public network.

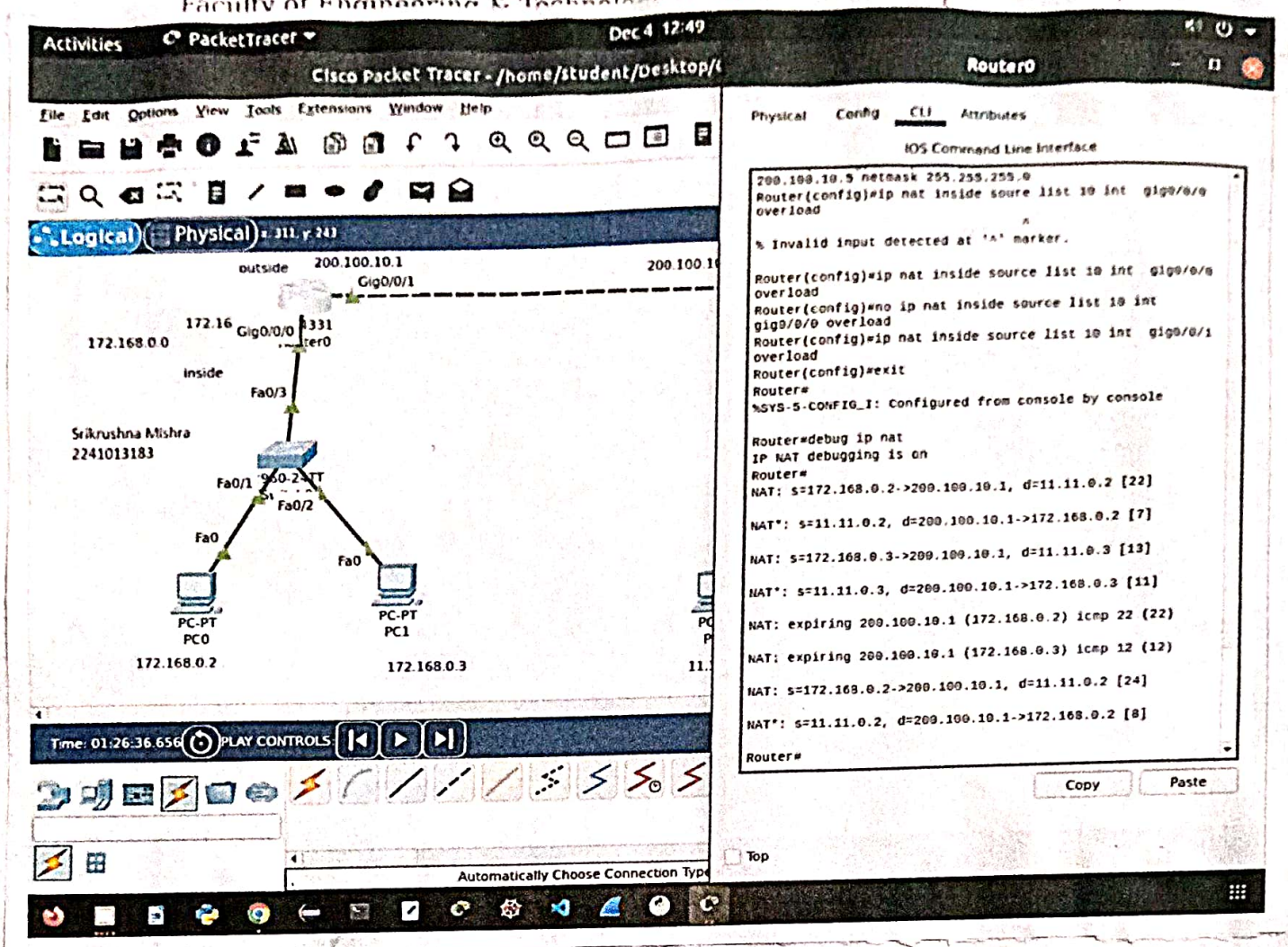
Name: _____ Regd. Number: _____



Source	Destination
PC0	PC2
PC0	PC3
PC1	PC2

All the ICMP messages were transferred successfully from source to destination using port address translation

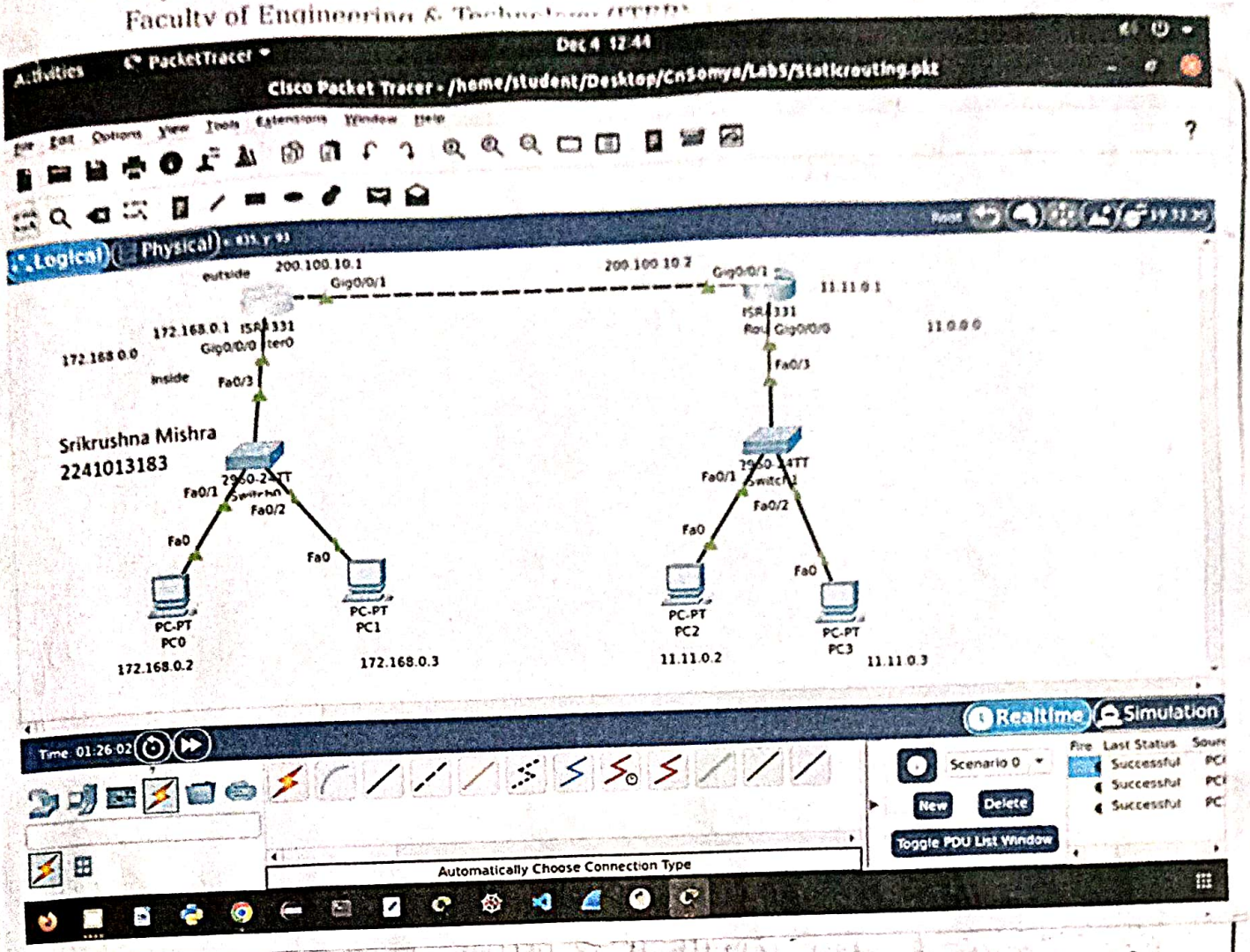
Name:_____ Regd. Number:_____



→ We are using same IP address as we used in dynamic routing.

→ Now, in command line interface, we have to first turn off router 0 dynamic routing then only we can do port address translation to convert multiple IP addresses or a nbo to a single IPv4 address.

Name: _____ Regd. Number: _____



Source	Destination	A message was passed from PC0 to PC2. This is the PDU information of PC2 when the message reached PC2
PC0	PC2	

Conclusion:-

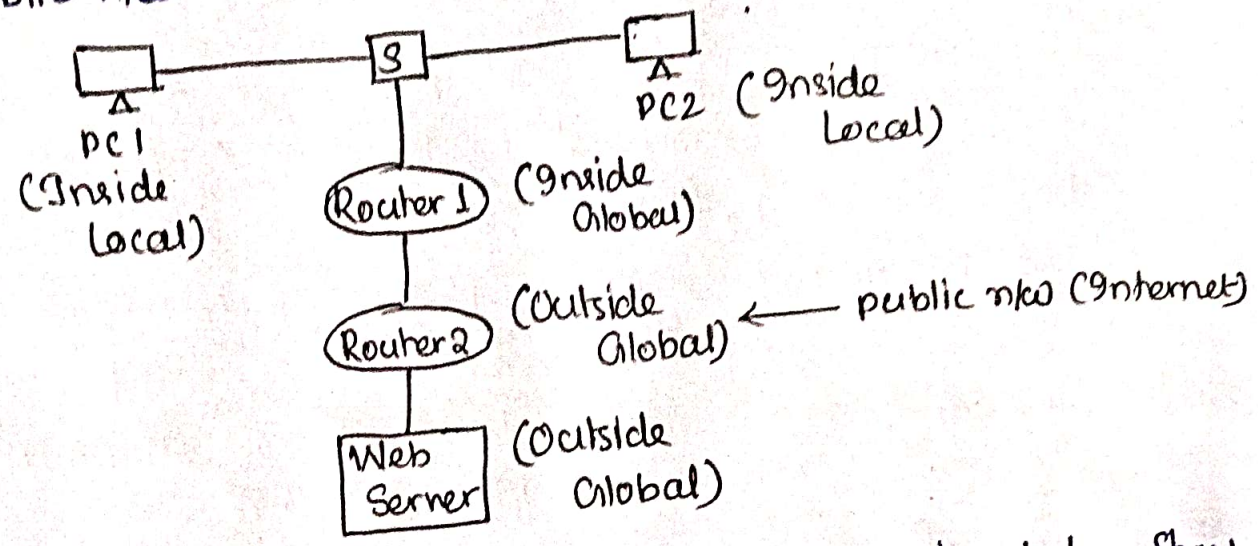
This experiment provides a hands-on experience with the dynamic n/w address translation & PAT, their uses, their understanding and their implementation through CLI.

Also, connecting & establishing connection through PAT which converts a pool of IPv4 addresses or a private n/w to a single IPv4 public addresses.

Name:_____ Regd. Number:_____

Exercises:-

1) Illustrates diagrammatically inside local, inside Global, Outside local, Outside Global address with an example n/w comprising of a private n/w with 2 pcs with a switch, two routers belonging to a public n/w and a public web server.



2) The list of private IP & the pool of public IP are as given below. Show the translation of each private IP to public IP using Dynamic NAT based on the access to public address by the PCs in order PC2, PC4, PC1 followed by PC3.

List of Inside local Address

PC1 : 10.7.7.61
PC2: 10.7.7.62
PC3: 10.7.7.63
PC4: 10.7.7.64

Pool of Inside Global Address

55.4.4.1
55.4.4.2
55.4.4.3

The order of access is PC2, then PC4, then PC1 & then PC3

→ So, first PC2 requested access to a public network
→ It is mapped to 55.4.4.1. So, 10.7.7.62 → 55.4.4.1

Now PC4, So. 10.7.7.64 → 55.4.4.2

PC1, So. 10.7.7.61 → 55.4.4.3

Now, for PC3, since 55.4.4.1 and 55.4.4.2 are already in use

Name:_____ Regd Number:_____

So, PC3 will be mapped to 55.4.4.1 (The first available address in the pool). So, 10.7.7.63 → 55.4.4.1

→

Inside Local IP	Inside Global
10.7.7.62 (PC2)	55.4.4.1
10.7.7.64 (PC4)	55.4.4.2
10.7.7.61 (PC1)	55.4.4.3
10.7.7.63 (PC3)	55.4.4.4

3) What are the advantages & disadvantages of dynamic NAT?

Advantages of dynamic NAT:-

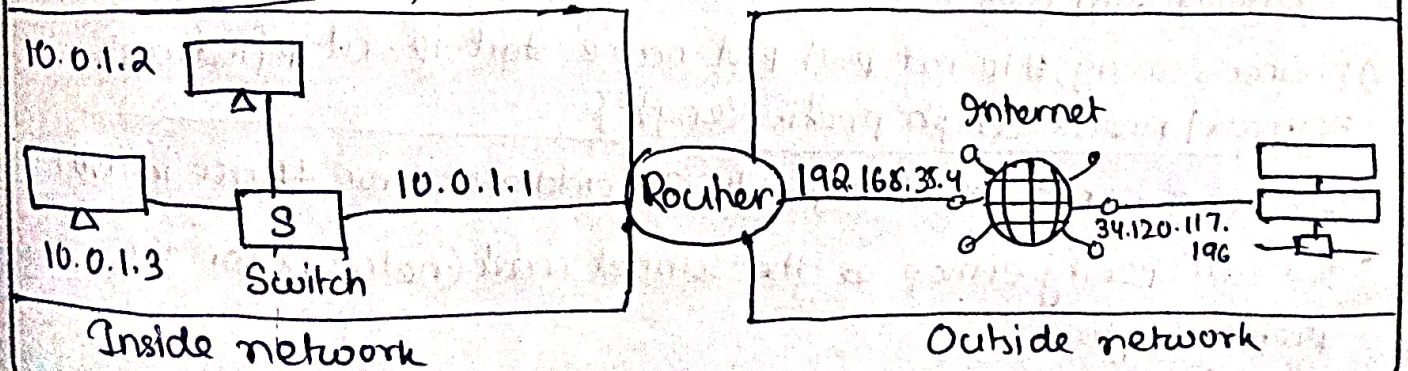
i) Efficient use of IP addresses.
ii) Scalable as it supports a large no. of devices
iii) It automatically allocates public IPs, thus reduces the burden on administration

Disadvantages of dynamic NAT:-

(i) Limited pool size
(ii) If all public IPs in the pool are in use, additional devices attempting to communicate will fail
(iii) It potentially has processing overhead thus causes delay in high-traffic networks.

4) Show the port address translation table at the router of following nw.

Address Translation Table



Name:_____ Regd. Number:_____

By having such connection, the PAT table at the router might look like

Inside Local IP and Port	Inside Global IP and Port	Outside Global IP and Port
10.0.1.3:5000	192.168.3.5.4:40001	34.120.11.7.196:80
10.0.1.2:6000	192.168.3.5.4:40002	34.120.11.7.196:443

5) Describe the function of following CLI commands:

(i) ip nat inside (ii) ip nat outside (iii) ip nat pool

(iv) ip nat inside source list ACL_NUMBER pool NAME global configuration

(v) router(config)#ip nat pool pool-name start-ip end-ip {netmask netmask | prefix-length prefix-length}

(i) ip nat inside - Assigns an interface as being on the inside (local n/w) of a NAT configuration.

(ii) ip nat outside - Assign an interface is being on the outside (external/public n/w) of a NAT configuration

(iii) ip nat pool - Defined a pool of public IP address to be used for NAT translation.

(iv) ip nat inside source list ACL_NUMBER pool NAME global configuration

- It specifies NAT translation rules for packets originating from the inside n/w.
- Maps private IPs (specified in an ACL) to public IPs from the defined NAT pool.

(v) router (config)#ip nat pool pool-name start-ip end-ip {netmask netmask | prefix-length prefix-length}

- Creates a named pool of public IP addresses for use in NAT
- You can specify either the subnet mask (network) or the prefix-length.

Name:_____ Regd. Number:_____