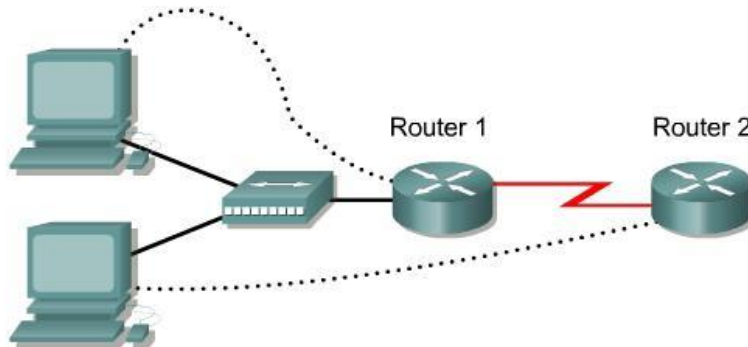## Lab 4

## Verifying NAT and PAT Configuration



| Router Designation | Router Name | FastEthernet 0 Address/ Subnet Mask | Interface Type | Serial 0 Address/ Subnet Mask | Loopback 0 Address/ Subnet Mask | Enable Secret Password | Enable/VTY/ Console Passwords |
|---|---|---|---|---|---|---|---|
| Router 1 | Gateway | 10.10.10.1/24 | DCE | 200.2.2.18/30 | NA | class | cisco |
| Router 2 | ISP | NA | DTE | 200.2.2.17/30 | 172.16.1.1/32 | class | cisco |

| | |
|---|---|
| Straight-through cable | |
| Serial cable | |
| Console (rollover) | |
| Crossover cable | |

### Objective

- ☐ Configure a router for Network Address Translation (NAT) and Port Address Translation (PAT)
- ☐ Test the configuration and verify NAT/PAT statistics

### Background/Preparation

The ISP has allocated a company the public CIDR IP address 199.99.9.32/30. This is equivalent to four public IP addresses. Since the company has an internal requirement for more than 30 addresses, the IT manager has decided to use NAT with PAT. Routing between the ISP and the gateway router is done using a static route between the ISP and the gateway, and a default route between the gateway and the ISP. The ISP connection to the Internet will be represented by a loopback address on the ISP router.

Cable a network similar to the one in the diagram above. Any router that meets the interface requirements displayed on the above diagram may be used. This includes the following and any of their possible combinations:

- ☐ 800 series routers
- ☐ 1600 series routers
- ☐ 1700 series routers
- ☐ 2500 series routers
- ☐ 2600 series routers

.

Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. Conduct the following steps on each router unless specifically instructed otherwise.

Start a HyperTerminal session.

> **Note:** Refer to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

## Step 1 Configure the routers

Configure all of the following according to the chart:

- ☐ The hostname
- ☐ The console
- ☐ The virtual terminal
- ☐ The enable passwords
- ☐ The interfaces

If problems occur during this configuration, refer to Lab 1.1.4a Configuring NAT.

## Step 2 Save the configuration

At the privileged EXEC mode prompt, on both routers, type the command `copy running-config startup-config`.

## Step 3 Configure the hosts with the proper IP address, subnet mask, and default gateway

Each workstation should be able to ping the attached router. If for some reason this is not the case, troubleshoot as necessary. Check and verify that the workstation has been assigned a specific IP address and default gateway. If running Windows 98, check using **Start** > **Run** > **winipcfg**. If running Windows 2000 or higher, check using `ipconfig` in a DOS window.

## Step 4 Verify that the network is functioning

a. From the attached hosts, ping the FastEthernet interface of the default gateway router.

b. Was the ping from the first host successful? _____

c. Was the ping from the second host successful? _____

d. If the answer is no for either question, troubleshoot the router and host configurations to find the error. Then ping again until they both are successful.

## Step 5 Create a static route

a. Create a static route from the ISP to the Gateway router. Addresses 199.99.9.32/27 have been allocated for Internet access outside of the company. Use the `ip route` command to create the static route.

```
ISP(config)#ip route 199.99.9.32 255.255.224.0 200.2.2.18
```

b. Is the static route in the routing table? _____

c. What command checks the routing table contents? _____

d. If the route was not in the routing table, give one reason why this might be so?

_____

### Step 6 Create a default route

a.  Add a default route, using the **ip route** command, from the Gateway router to the ISP router. This will forward any unknown destination address traffic to the ISP:

```
Gateway(config)#ip route 0.0.0.0 0.0.0.0 200.2.2.17
```

b.  Is the static route in the routing table? _____

c.  Try to ping from one of the workstations to the ISP serial interface IP address.

d.  Was the ping successful? _____

e.  Why? _____

### Step 7 Define the pool of usable public IP addresses

To define the pool of public addresses, use the **ip nat pool** command:

```
Gateway(config)#ip nat pool public-access 199.99.9.32
199.99.9.35 netmask 255.255.255.252
```

### Step 8 Define an access list that will match the inside private IP addresses

To define the access list to match the inside private addresses, use the **access list** command:

```
Gateway(config)#access-list 1 permit 10.10.10.0 0.0.0.255
```

### Step 9 Define the NAT translation from inside list to outside pool

To define the NAT translation, use the **ip nat inside source** command:

```
Gateway(config)#ip nat inside source list 1 pool public-access overload
```

### Step 10 Specify the interfaces

The active interfaces on the router need to be identified as either inside or outside interfaces with respect to NAT. To do this, use the **ip nat inside** or **ip nat outside** command:

```
Gateway(config)#interface fastethernet 0
Gateway(config-if)#ip nat inside
Gateway(config-if)#interface serial 0
Gateway(config-if)#ip nat outside
```

### Step 11 Testing the configuration

a.  From the workstations, **ping 172.16.1.1**. Open multiple DOS windows on each workstation and Telnet to the 172.16.1.1 address. Next, view the NAT translations on the Gateway router, with the command **show ip nat translations**.

b.  What is the translation of the inside local host addresses?

_____ = _____ _____ = _____

## Step 12 Verify NAT and PAT Statistics

a. To view the NAT and PAT statistics type the **`show ip nat statistics`** command at the privileged EXEC mode prompt.

b. How many active translations have taken place? _____

c. How many addresses are in the pool? _____

d. How many addresses have been allocated so far? _____

Upon completion of the previous steps finish the lab by doing the following:

☐ Logoff by typing **`exit`**

☐ Turn the router off

☐ Remove and store the cables and adapter

## Configuration reference sheet

This sheet contains the basic configuration commands for the ISP and Gateway routers:

```
ISP
Router#configure terminal
Router(config)#hostname ISP
ISP(config)#enable password cisco
ISP(config)#enable secret class
ISP(config)#line console 0
ISP(config-line)#password cisco
ISP(config-line)#login
ISP(config-line)#exit
ISP(config)#line vty 0 4
ISP(config-line)#password cisco
ISP(config-line)#login
ISP(config-line)#exit
ISP(config)#interface loopback 0
ISP(config-if)#ip address 172.16.1.1 255.255.255.255
ISP(config-if)#no shutdown
ISP(config-if)#exit
ISP(config)#interface serial 0
ISP(config-if)#ip address 200.2.2.17 255.255.255.252
ISP(config-if)#no shutdown
ISP(config-if)#clockrate 64000
ISP(config)#ip route 199.99.9.32 255.255.255.224
200.2.2.18 ISP(config)#end
ISP#copy running-config startup-config


Gateway
Router#configure terminal
Router(config)#hostname Gateway
Gateway(config)#enable password cisco
Gateway(config)#enable secret class
Gateway(config)#line console 0
Gateway(config-line)#password cisco
Gateway(config-line)#login
Gateway(config-line)#exit
Gateway(config)#line vty 0 4
Gateway(config-line)#password cisco
Gateway(config-line)#login
Gateway(config-line)#exit
Gateway(config)#interface fastethernet 0
Gateway(config-if)#ip address 10.10.10.1 255.255.255.0
Gateway(config-if)#no shutdown
Gateway(config-if)#exit
Gateway(config)#interface serial 0
Gateway(config-if)#ip address 200.2.2.18 255.255.255.252
Gateway(config-if)#no shutdown
Gateway(config)#ip route 0.0.0.0 0.0.0.0 200.2.2.17
```

## Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class** (if that does not work, ask the instructor).

```
Router>enable
```

At the privileged EXEC mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue? [confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command **reload**.

```
Router(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started!
```

Press **Enter**.

Now the router is ready for the assigned lab to be performed.

| Router Model | Ethernet Interface #1 | Ethernet Interface #2 | Serial Interface #1 | Serial Interface #2 |
|---|---|---|---|---|
| 800 (806) | Ethernet 0 (E0) | Ethernet 1 (E1) | | |
| 1600 | Ethernet 0 (E0) | Ethernet 1 (E1) | Serial 0 (S0) | Serial 1 (S1) |
| 1700 | FastEthernet 0 (FA0) | FastEthernet 1 (FA1) | Serial 0 (S0) | Serial 1 (S1) |
| 2500 | Ethernet 0 (E0) | Ethernet 1 (E1) | Serial 0 (S0) | Serial 1 (S1) |
| 2600 | FastEthernet 0/0 (FA0/0) | FastEthernet 0/1 (FA0/1) | Serial 0/0 (S0/0) | Serial 0/1 (S0/1) |