



## How to Configure Static NAT in Cisco Router

This tutorial explains Static NAT configuration in detail. Learn how configure static NAT, map address (inside local address, outside local address, inside global address and outside global address), debug and verify Static NAT translation step by step with practical examples in packet tracer.

In order to configure NAT we have to understand four basic terms; inside local, inside global, outside local and outside global. These terms define which address will be mapped with which address.

Term	Description
Inside Local IP Address	Before translation source IP address located inside the local network.
Inside Global IP Address	After translation source IP address located outside the local network.
Outside Global IP Address	Before translation destination IP address located outside the remote network.
Outside Local IP Address	After translation destination IP address located inside the remote network.

For this tutorial I assume that you are familiar with these basic terms. If you want to learn these terms in detail please go through the first part of this article which explains them in details with examples.

This tutorial is the second part of our article "**Learn NAT (Network Address Translation) Step by Step in Easy Language with Examples**". You can read other parts of this article here.

### [Basic Concepts of NAT Explained in Easy Language](#)

*This tutorial is the first part of this article. This tutorial explains basic concepts of static nat, dynamic nat, pat inside local, outside local, inside global and outside global in detail with examples.*

### [How to Configure Dynamic NAT in Cisco Router](#)

*This tutorial is the third part of this article. This tutorial explains how to configure Dynamic NAT (Network Address Translation) in Cisco Router step by step with packet tracer examples.*

### [Configure PAT in Cisco Router with Examples](#)

*This tutorial is the last part of this article. This tutorial explains how to configure PAT (Port Address Translation) in Cisco Router step by step with packet tracer examples.*

## Static NAT Practice LAB Setup

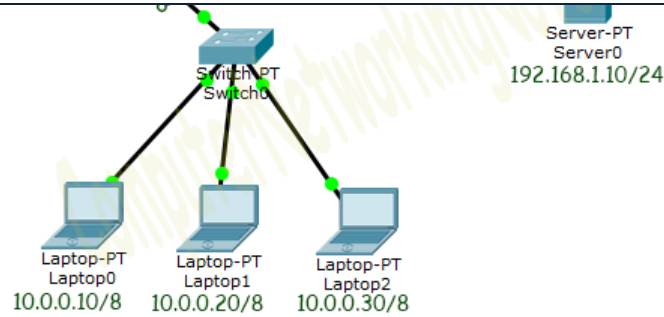
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To explain Static NAT Configuration, I will use packet tracer network simulator software. You can use any network simulator software or can use real Cisco devices to follow this guide. There is no difference in output as long as your selected software contains the commands explained in this tutorial.

Create a practice lab as shown in following figure or download this pre-created practice lab and load in packet tracer

[Download NAT Practice LAB with initial IP configuration](#)



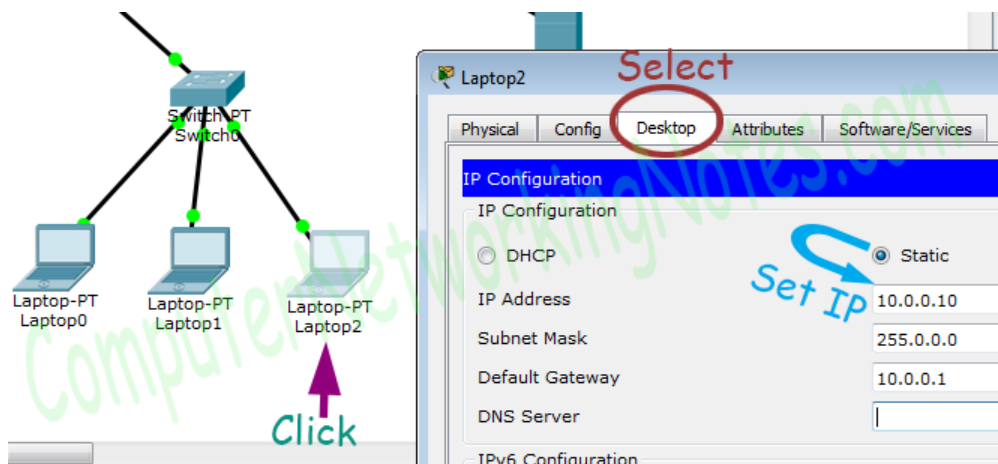
If require, you can download the latest as well as earlier version of Packet Tracer from here. [Download Packet Tracer](#)

## Initial IP Configuration

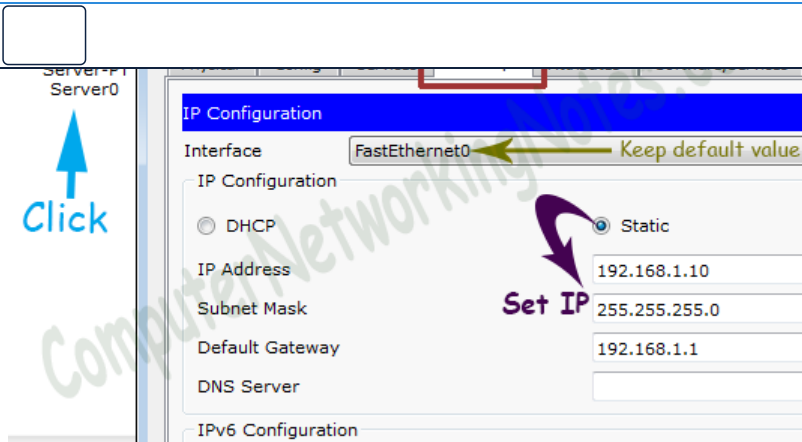
Device / Interface	IP Address	Connected With
Laptop0	10.0.0.10/8	Fa0/0 of R0
Laptop1	10.0.0.20/8	Fa0/0 of R0
Laptop2	10.0.0.30/8	Fa0/0 of R0
Server0	192.168.1.10/24	Fa0/0 of R1
Serial 0/0/0 of R1	100.0.0.1/8	Serial 0/0/0 of R2
Serial 0/0/0 of R2	100.0.0.2/8	Serial 0/0/0 of R2

If you are following this tutorial on my practice topology, skip this IP configuration section as that topology is already configured with this initial IP configuration

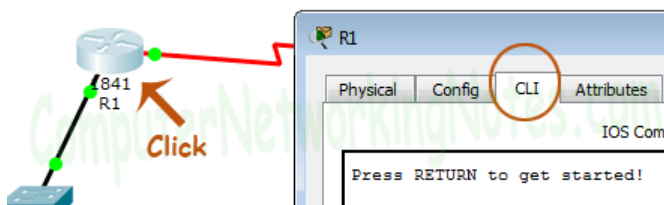
To assign IP address in Laptop click **Laptop** and click **Desktop** and **IP configuration** and Select **Static** and **set IP address** as given in above table.



Following same way configure IP address in Server.



To configure IP address in Router1 click **Router1** and select **CLI** and press **Enter** key.



Two interfaces of Router1 are used in topology; FastEthernet0/0 and Serial 0/0/0.



By default interfaces on router are remain administratively down during the start up. We need to configure IP address and other parameters on interfaces before we could actually use them for routing. Interface mode is used to assign the IP address and other parameters. Interface mode can be accessed from global configuration mode. Following commands are used to access the global configuration mode.

```
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

Before we configure IP address in interfaces let's assign a unique descriptive name to router.

```
Router(config)#hostname R1
R1#
```

Now execute the following commands to set IP address in FastEthernet 0/0 interface.

```
R1(config)#interface FastEthernet0/0
R1(config-if)#ip address 10.0.0.1 255.0.0.0
R1(config-if)#no shutdown
R1(config-if)#exit
```

**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.



parameters are always configured at DCE end.

We can use show controllers interface command from privilege mode to check the cable's end.

```
R1(config)#exit
R1#show controllers serial 0/0/0
Interface Serial0/0/0
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 2000000
[Output omitted]
```

Fourth line of output confirms that DCE end of serial cable is attached. If you see DTE here instead of DCE skip these parameters.

Now we have necessary information let's assign IP address to serial interface.

```
R1#configure terminal
R1(config)#interface Serial0/0/0
R1(config-if)#ip address 100.0.0.1 255.0.0.0
R1(config-if)#clock rate 64000
R1(config-if)#bandwidth 64
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
```

Router#configure terminal Command is used to enter 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 address to interface.

**Router(config-if)#clock rate 64000**

In real life environment this parameter controls the data flow between serial links and need to be set at service provider's end. In lab environment we need not to worry about this value. We can use any valid rate here.

**Router(config-if)#bandwidth 64**

Bandwidth works as an influencer. It is used to influence the metric calculation of EIGRP or any other routing protocol which uses bandwidth parameter in route selection process.

**Router(config-if)#no shutdown** Command brings interface up.

**Router(config-if)#exit** Command is used to return in global configuration mode.

We will use same commands to assign IP addresses on interfaces of Router2. We need to provide clock rate and bandwidth only on DCE side of serial interface. Following command will assign IP addresses on interface of Router2.

## Initial IP configuration in R2

```
Router>enable
Router#configure terminal
Router(config)#hostname R2
R2(config)#interface FastEthernet0/0
R2(config-if)#ip address 192.168.1.1 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface Serial0/0/0
R2(config-if)#ip address 100.0.0.2 255.0.0.0
R2(config-if)#no shutdown
```

## Configure Static NAT

Static NAT configuration requires three steps: -

1. Define IP address mapping
2. Define inside local interface
3. Define inside global interface

Since static NAT use manual translation, we have to map each inside local IP address (which needs a translation) with inside global IP address. Following command is used to map the inside local IP address with inside global IP address.

```
Router(config)#ip nat inside source static [inside local ip address] [inside global IP address]
```

For example in our lab Laptop1 is configured with IP address 10.0.0.10. To map it with 50.0.0.10 IP address we will use following command

```
Router(config)#ip nat inside source static 10.0.0.10 50.0.0.10
```

In second step we have to define which interface is connected with local the network. On both routers interface Fa0/0 is connected with the local network which need IP translation.

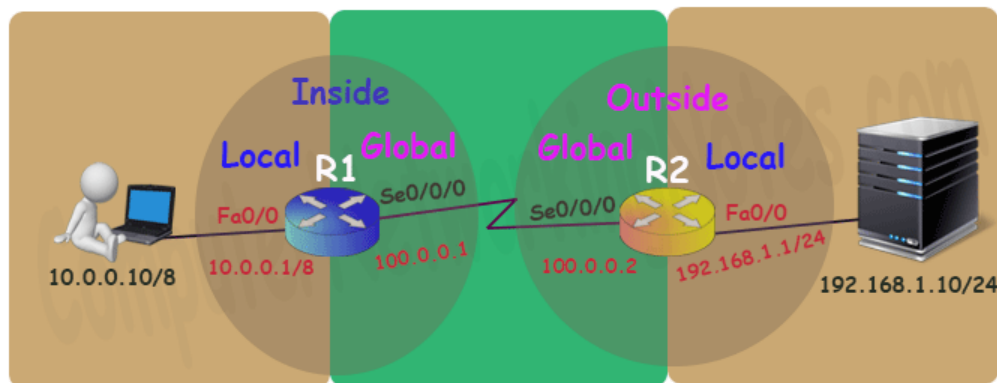
Following command will define interface Fa0/0 as inside local.

```
Router(config-if)#ip nat inside
```

In third step we have to define which interface is connected with the global network. On both routers serial 0/0/0 interface is connected with the global network. Following command will define interface Serial0/0/0 as inside global.

```
Router(config-if)#ip nat outside
```

Following figure illustrates these terms.



Let's implement all these commands together and configure the static NAT.

### R1 Static NAT Configuration

```
R1(config)#ip nat inside source static 10.0.0.10 50.0.0.10
R1(config)#interface FastEthernet 0/0
R1(config-if)#ip nat inside
R1(config-if)#exit
R1(config)#
R1(config)#interface Serial 0/0/0
R1(config-if)#ip nat outside
R1(config-if)#exit
```



```
R1(config)#ip nat inside source static 10.0.0.30 50.0.0.30
```

## R2 Static NAT Configuration

```
R2(config)#ip nat inside source static 192.168.1.10 200.0.0.10
R2(config)#interface FastEthernet 0/0
R2(config-if)#ip nat inside
R2(config-if)#exit
R2(config)#
R2(config)#interface Serial 0/0/0
R2(config-if)#ip nat outside
R2(config-if)#exit
```

Before we test this lab we need to configure the IP routing. IP routing is the process which allows router to route the packet between different networks. Following tutorial explain routing in detail with examples

[Routing concepts Explained with Examples](#)

## Configure static routing in R1

```
R1(config)#ip route 200.0.0.0 255.255.255.0 100.0.0.2
```

## Configure static routing in R2

```
R2(config)#ip route 50.0.0.0 255.0.0.0 100.0.0.1
```

## Testing Static NAT Configuration

In this lab we configured static NAT on R1 and R2. On R1 we mapped inside local IP address 10.0.0.10 with inside global address 50.0.0.10 while on R2 we mapped inside local IP address 192.168.1.10 with inside global IP address 200.0.0.10.

Device	Inside Local IP Address	Inside Global IP Address
Laptop0	10.0.0.10	50.0.0.10
Server	192.168.1.10	200.0.0.10

To test this setup click Laptop0 and Desktop and click Command Prompt.

Run **ipconfig** command.

Run **ping 200.0.0.10** command.

Run **ping 192.168.1.10** command.



```

C:\>ipconfig

FastEthernet0 Connection: (default port)

    Link-local IPv6 Address . . . . . : FE80::260:5CFF:FE8C:4886
    IP Address. . . . . : 10.0.0.10
    Subnet Mask . . . . . : 255.0.0.0
    Default Gateway . . . . . : 10.0.0.1

C:\>ping 200.0.0.10

Pinging 200.0.0.10 with 32 bytes of data:

Reply from 200.0.0.10: bytes=32 time=13ms TTL=126
Reply from 200.0.0.10: bytes=32 time=14ms TTL=126
Reply from 200.0.0.10: bytes=32 time=13ms TTL=126
Reply from 200.0.0.10: bytes=32 time=12ms TTL=126

Ping statistics for 200.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 12ms, Maximum = 14ms, Average = 13ms

C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Request timed out.

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>

```

First command verifies that we are testing from correct NAT device.

Second command checks whether we are able to access the remote device or not. A ping reply confirms that we are able to connect with remote device on this IP address.

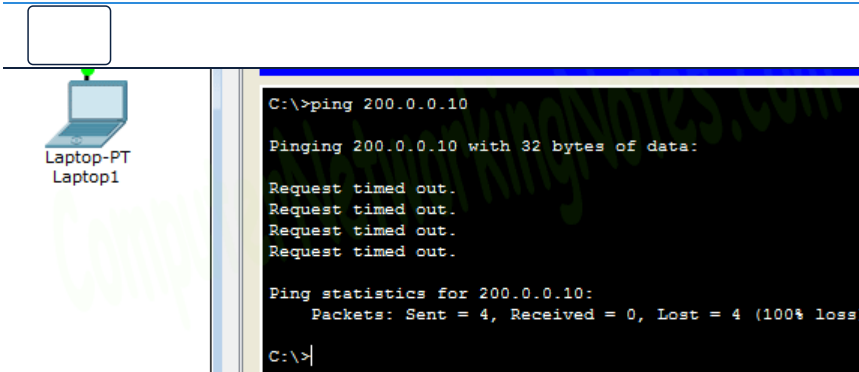
Third command checks whether we are able to access the remote device on its actual IP address or not. A ping error confirms that we are not able to connect with remote device on this IP address.

Let's do one more testing. Click **Laptop0** and click **Desktop** and click **Web Browser** and access 200.0.0.10.



Above figure confirms that host 10.0.0.10 is able to access the 200.0.0.10.

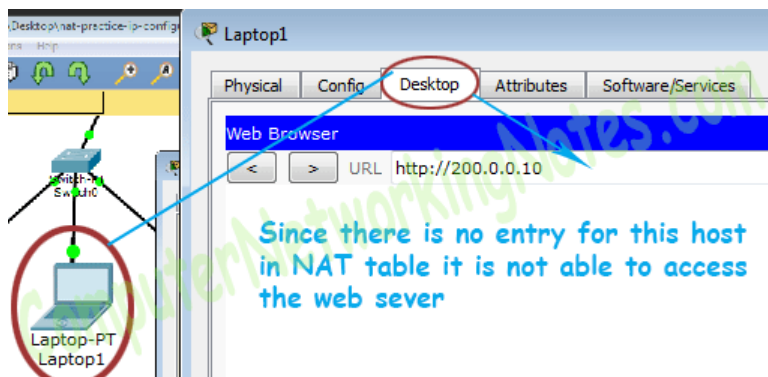
Now run **ping 200.0.0.10** command from Laptop1.



*Why we are not able to connect with the remote device from this host?*

Because we configured NAT only for one host (Laptop0) which IP address is 10.0.0.10. So only the host 10.0.0.10 will be able to access the remote device.

To confirm it again, let's try to access web service from this host.



If you followed this tutorial step by step, you should get the same output of testing. Although it's very rare but some time you may get different output. To figure out what went wrong you can use my practice topology with all above configuration. Download my practice topology

[Download NAT Practice LAB with Static NAT configuration](#)

We can also verify this translation on router with **show ip nat translation** command.

Following figure illustrate this translation on router R1.

```
R1#show ip nat translations
Pro Inside global      Inside local      Outside local      Outside global
icmp 200.0.0.10:13     10.0.0.10:13     200.0.0.10:13     200.0.0.10:13
icmp 200.0.0.10:14     10.0.0.10:14     200.0.0.10:14     200.0.0.10:14
icmp 200.0.0.10:15     10.0.0.10:15     200.0.0.10:15     200.0.0.10:15
icmp 200.0.0.10:16     10.0.0.10:16     200.0.0.10:16     200.0.0.10:16
tcp 50.0.0.10:1030     10.0.0.10:1030   200.0.0.10:80     200.0.0.10:80
tcp 50.0.0.10:1031     10.0.0.10:1031   200.0.0.10:80     200.0.0.10:80
R1#
```

Following figure illustrate this translation on router R2

```
R2#show ip nat translations
Pro Inside global      Inside local      Outside local      Outside global
icmp 200.0.0.10:13     192.168.1.10:13  50.0.0.10:13     50.0.0.10:13
icmp 200.0.0.10:14     192.168.1.10:14  50.0.0.10:14     50.0.0.10:14
icmp 200.0.0.10:15     192.168.1.10:15  50.0.0.10:15     50.0.0.10:15
icmp 200.0.0.10:16     192.168.1.10:16  50.0.0.10:16     50.0.0.10:16
tcp 200.0.0.10:80      192.168.1.10:80  50.0.0.10:1030   50.0.0.10:1030
tcp 200.0.0.10:80      192.168.1.10:80  50.0.0.10:1031   50.0.0.10:1031
R2#
```

*Pay a little bit extra attention on outside local address filed. Have you noticed one interesting feature of NAT in above output? Why actual outside local IP address is not listed in this filed?*

The actual IP address is not listed here because router is receiving packets after the translation. From R1's point of view remote device's IP address is 200.0.0.10 while from R2's point of view end device's IP address is 50.0.0.10.





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