NetSim®
NETWORK SIMULATOR®

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NetSim® NETWORK SIMULATOR®

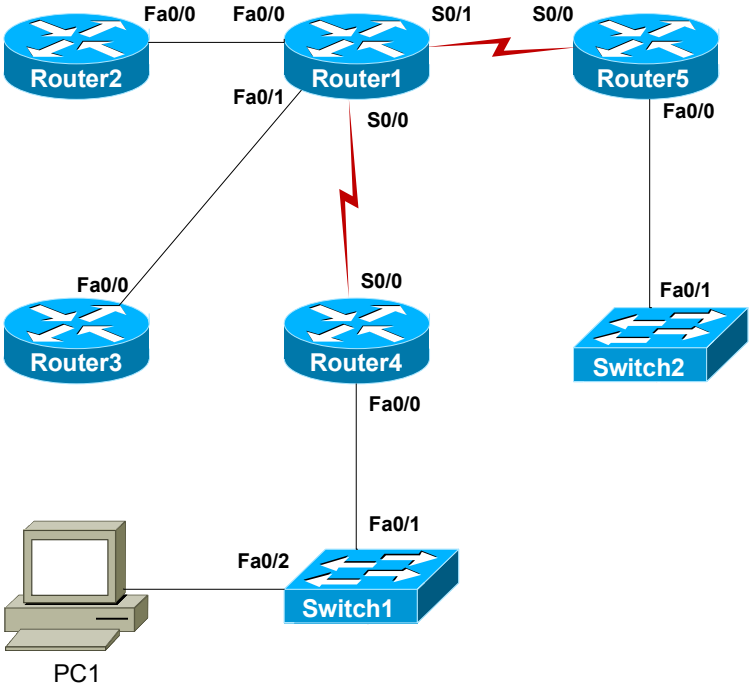
# Stand-Alone Lab: Static Routes I

## Objective

Learn to add static routes to routers so that devices in different subnets can communicate.

## Lab Topology

The topology diagram below represents the NetMap in the Simulator.




## Command Summary

| Command | Description |
|---|---|
| **clock rate** *clock-rate* | sets the clock rate for a Data Communications Equipment (DCE) interface |
| **configure terminal** | enters global configuration mode from privileged EXEC mode |
| **enable** | enters privileged EXEC mode |
| **end** | ends and exits configuration mode |
| **exit** | exits one level in the menu structure |
| **hostname** *host-name* | sets the device name |
| **interface** *type number* | changes from global configuration mode to interface configuration mode |
| **ip address** *ip-address subnet-mask* | assigns an IP address to an interface |
| **ip route** *destination-prefix destination-prefix-mask* {*ip-address* \| *interface-type* [*ip-address*]} | establishes a static route |
| **no shutdown** | enables an interface |

| Command | Description |
|---|---|
| **ping** *ip-address* | sends an Internet Control Message Protocol (ICMP) echo request to the specified address |
| **show ip route** | displays the IP routing table |
| **show running-config** | displays the active configuration file |

The IP addresses and subnet masks used in this lab are shown in the table below:

## IP Addresses

| Device | Interface | IP Address | Subnet Mask |
|---|---|---|---|
| Router1 | FastEthernet 0/0<br>Serial 0/0 | 10.1.1.1<br>12.5.10.1 | 255.255.255.0<br>255.255.255.0 |
| Router2 | FastEthernet 0/0 | 10.1.1.2 | 255.255.255.0 |
| Router4 | Serial 0/0 | 12.5.10.2 | 255.255.255.0 |

## Lab Tasks

### Task 1: Configure the Router

This task involves configuring the three routers so that adjacent devices located in the same subnets can communicate.

1. Configure Router1 with the appropriate host name, IP addresses, and subnet masks; refer to the IP Addresses table. Enable the interfaces. Configure a clock rate of 64 Kbps on the Serial 0/0 interface. A clock rate must be configured on Router1 because it is the DCE end of the link to Router4.

2. Configure Router2 with the appropriate host name, IP address, and subnet mask; refer to the IP Addresses table. Enable the interface.

3. Configure Router4 with the appropriate host name, IP address, and subnet mask; refer to the IP Addresses table. Enable the interface.

4. On Router1, verify that you can ping the directly connected neighbors (10.1.1.2 and 12.5.10.2).

5. On Router4, attempt to ping the FastEthernet 0/0 interface on Router2 (10.1.1.2). The ping should not be successful.

6. On Router2, attempt to ping the Serial 0/0 interface on Router4 (12.5.10.2). The ping should not be successful.

7. Why do the pings from Router4 to Router2 and from Router2 to Router4 fail? _____

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### Task 2: Configure and Verify Static Routes

This task involves establishing static routes on each router to any location that is not directly connected. Router1 is directly connected to both Router2 and Router4, so it will not need any static routes. You will verify the configuration using **ping** and **show** commands.

1. On Router2, configure a static IP route to the 12.5.10.0 subnet. You should use the IP address of Router1's FastEthernet 0/0 interface as the gateway because any traffic destined to the 12.5.10.0 subnet can get there through Router1. Static routes are configured using the destination network address, destination subnet mask, and IP address of the closest port of the forwarding router.

2. On Router2, attempt to ping Router1's FastEthernet 0/0 interface (10.1.1.1), Router1's Serial 0/0 interface (12.5.10.1), and Router4's Serial 0/0 interface (12.5.10.2). Why is the ping to Router4's Serial 0/0 interface unsuccessful? _____

_____

3. On Router4, configure a static IP route to the 10.1.1.0 subnet. You should use the IP address of Router1's Serial 0/0 interface as the gateway because any traffic destined to the 10.1.1.0 subnet can get there through Router1.

4. On Router4, attempt to ping Router1's FastEthernet 0/0 interface (10.1.1.1), Router1's Serial 0/0 interface (12.5.10.1), and Router2's FastEthernet 0/0 interface (10.1.1.2). Are all pings successful?

_____

5. On Router4, view the routing table and verify that a route exists to the 10.1.1.0 subnet.

6. On Router2, view the routing table and verify that a route exists to the 12.5.10.0 subnet.

## Lab Solutions

### Task 1: Configure the Routers

1. Issue the following commands to configure Router1 with the appropriate host name, IP addresses, and subnet masks, to enable the interfaces, and to configure a clock rate on Router1's Serial 0/0 interface:

```
Router>enable
Router#configure terminal
Router(config)#hostname Router1
Router1(config)#interface fastethernet 0/0
Router1(config-if)#ip address 10.1.1.1 255.255.255.0
Router1(config-if)#no shutdown
Router1(config-if)#interface serial 0/0
Router1(config-if)#ip address 12.5.10.1 255.255.255.0
Router1(config-if)#clock rate 64000
Router1(config-if)#no shutdown
```

2. Issue the following commands to configure Router2 with the appropriate host name, IP address, and subnet mask, to enable the interface:

```
Router>enable
Router#configure terminal
Router(config)#hostname Router2
Router2(config)#interface fastethernet 0/0
Router2(config-if)#ip address 10.1.1.2 255.255.255.0
Router2(config-if)#no shutdown
```

3. Issue the following commands to configure Router4 with the appropriate host name, IP address, and subnet mask, to enable the interface:

```
Router>enable
Router#configure terminal
Router(config)#hostname Router4
Router4(config)#interface serial 0/0
Router4(config-if)#ip address 12.5.10.2 255.255.255.0
Router4(config-if)#no shutdown
```

4. Pings from Router1 to Router2's FastEthernet 0/0 interface (10.1.1.2) and Router4's Serial 0/0 interface (12.5.10.2) should be successful. If the pings fail, verify that you correctly configured the interfaces.

```
Router1(config-if)#end
Router1#ping 10.1.1.2
Router1#ping 12.5.10.2
```

5. A ping from Router4 to Router2's FastEthernet 0/0 interface should not be successful.

```
Router4(config-if)#end
Router4#ping 10.1.1.2
```

6. A ping from Router2 to Router4's Serial 0/0 interface should not be successful.

```
Router2(config-if)#end
Router2#ping 12.5.10.2
```

7. The pings from Router4 to Router2 and from Router2 to Router4 fail because neither device knows about the other device's subnet; neither device has a route to the neighbor that is not directly connected.

### Task 2: Configure and Verify Static Routes

This task involves establishing static routes on each router to any location that is not directly connected. Router1 is directly connected to both Router2 and Router4, so it will not need any static routes. You will verify the configuration using **ping** and **show** commands.

1. On Router2, issue the following commands to configure a static IP route to the 12.5.10.0 subnet. You should use the IP address of Router1's FastEthernet 0/0 interface as the gateway because any traffic destined to the 12.5.10.0 subnet can get there through Router1. Static routes are configured using the destination network address, destination subnet mask, and IP address of the closest port of the forwarding router, as shown in the ip route command syntax displayed below:

```
Router2#configure terminal
Router2(config)#ip route 12.5.10.0 255.255.255.0 10.1.1.1
```

2. The ping from Router2 to Router4's Serial 0/0 interface (12.5.10.2) is unsuccessful because once the packet reaches Router4, Router4 will try to send the packet back to the source address. When the packet reaches Router4, the source address is in the 10.1.1.0 subnet, and Router4 does not know how to get to that subnet. Pings to Router1's FastEthernet 0/0 interface (10.1.1.1) and Router1's Serial 0/0 interface (12.5.10.1) are successful.

```
Router2(config)#end
Router2#ping 12.5.10.2
Router2#ping 10.1.1.1
Router2#ping 12.5.10.1
```

3. On Router4, issue the following commands to configure a static IP route to the 10.1.1.0 subnet. You should use the IP address of Router1's Serial 0/0 interface as the gateway because any traffic destined to the 10.1.1.0 subnet can get there through Router1.

```
Router4#configure terminal
Router4(config)#ip route 10.1.1.0 255.255.255.0 12.5.10.1
```

4. Yes, all pings from Router4 to Router1's Serial 0/0 interface (12.5.10.1), Router1's FastEthernet 0/0 interface (10.1.1.1), and Router2's FastEthernet 0/0 interface (10.1.1.2) are successful.

```
Router4(config)#end
Router4#ping 12.5.10.1
Router4#ping 10.1.1.1
Router4#ping 10.1.1.2
```

5. Sample output from the **show ip route** command on Router4 shows that a route exists to the 10.1.1.0 subnet:

```
Router4#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
       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, * - candidate default
       U - per-user static route

Gateway of last resort is not set

     12.0.0.0/24 is subnetted, 1 subnets
C       12.5.10.0 is directly connected, Serial0/0
     10.0.0.0/24 is subnetted, 1 subnets
S       10.1.1.0 [1/0] via 12.5.10.1
```

6. Sample output from the **show ip route** command on Router2 shows that a route exists to the 12.5.10.0 subnet:

```
Router2#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
       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, * - candidate default
       U - per-user static route

Gateway of last resort is not set

     10.0.0.0/24 is subnetted, 1 subnets
C       10.1.1.0 is directly connected, FastEthernet0/0
     12.0.0.0/24 is subnetted, 1 subnets
S       12.5.10.0 [1/0] via 10.1.1.1
```

## Sample Configuration Script

**Router2**

```
Router2#show running-config
Building configuration...
Current configuration : 700 bytes
!
Version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router2
!
ip subnet-zero
!
ip cef
no ip domain-lookup
!
interface Serial0/0
 no ip address
 no ip directed-broadcast
 shutdown
!
interface Serial0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
interface FastEthernet0/0
 ip address 10.1.1.2 255.255.255.0
 no ip directed-broadcast
!
interface FastEthernet0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
ip classless
no ip http server
!
ip route 12.5.10.0 255.255.255.0 10.1.1.1
!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
end
```