



Computer Networks-Lab



Instructor: Engr. Khuram Shahzad

CL30001 – Computer Networks-Lab

SEMESTER Fall 2021

Computer Networks - Lab 10

OBJECTIVES

After these Lab students shall be able to perform

- **Configuration of static routing**
- **Configure static routing in two routers.**
- **Configure static routing in Multi Routers.**
- **Ip route command**

PRE-LAB READING ASSIGNMENT

Remember the delivered lecture carefully.

Table of Contents

Computer Networks - Lab 10	1
OBJECTIVES	1
PRE-LAB READING ASSIGNMENT	1
IP route command	3
Connect 2 Routers:	4
Static Routing (connect 3 Routers):	6
Router 1 Configuration	7
Router 3 Configuration	8
Router 2 Configuration	10
IP Route in R1:.....	11
IP Route in R2:.....	11
IP Route in R3:.....	12
Lab 10 Home Work (Task for students):	Error! Bookmark not defined.

IP route command

IP route command is used to configure the static route. Static routes are the most secure way of routing. They will also increase overall network performance. These features are extremely helpful in small network.

```
Router(config)# ip route destination_network_# [subnet_mask]  
IP_address_of_next_hop_neighbor
```

And

```
Router(config)# ip route destination_network_# [subnet_mask]  
interface_to_exit
```

Let's explore above commands in detail

[ip route](#)

This is the base command which adds new route in routing table.

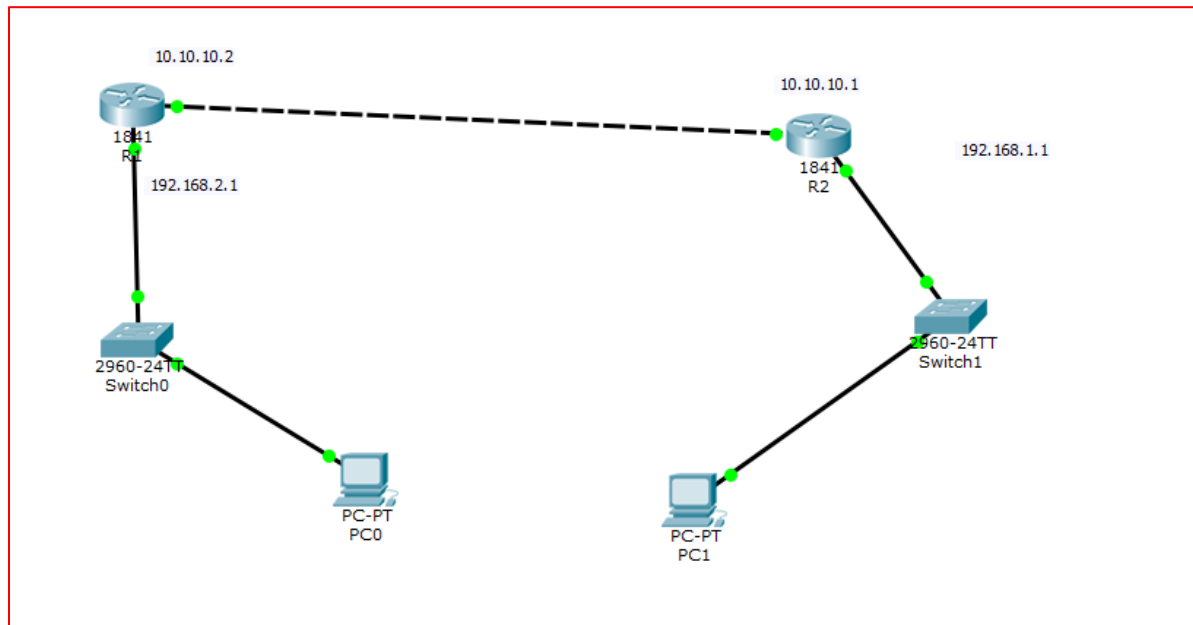
[destination_network_#\[subnet_mask\]](#)

This is the first parameter. It specifies the destination network address. We need to provide subnet mask if we are using sub-network. Sub-networks are the smaller networks created from one large network in subnetting. If we are not using sub-network then we can omit the subnet mask value. It will parse automatically.

[IP_address_of_next_hop_neighbor / interface_to_exit](#)

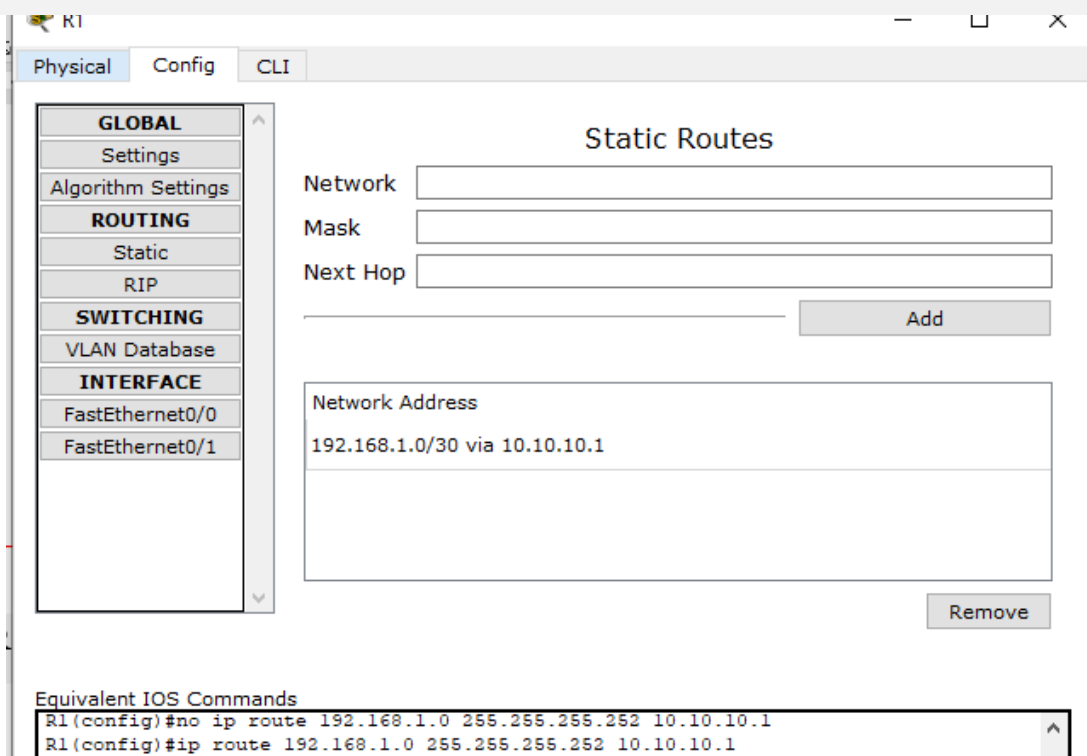
This parameter provides a way to reach the destination network. Both commands use separate way to assign this value. First command provides the IP address of next hop neighbor. It tells router that if it receives a packet for destination [that we set in previous parameter], forward that packet to this next hop neighbor IP address.

Second command also do the same job but in different way. It specifies exit interface instead of next hop IP address. It tells router that if it receives a packet for the destination specified by previous parameter then exits that packet from this interface. Device attached on other end of this interface will take care of the packet.

Connect 2 Routers:

Assigned Ip address to router interfaces. After it Just write this command in router 1.

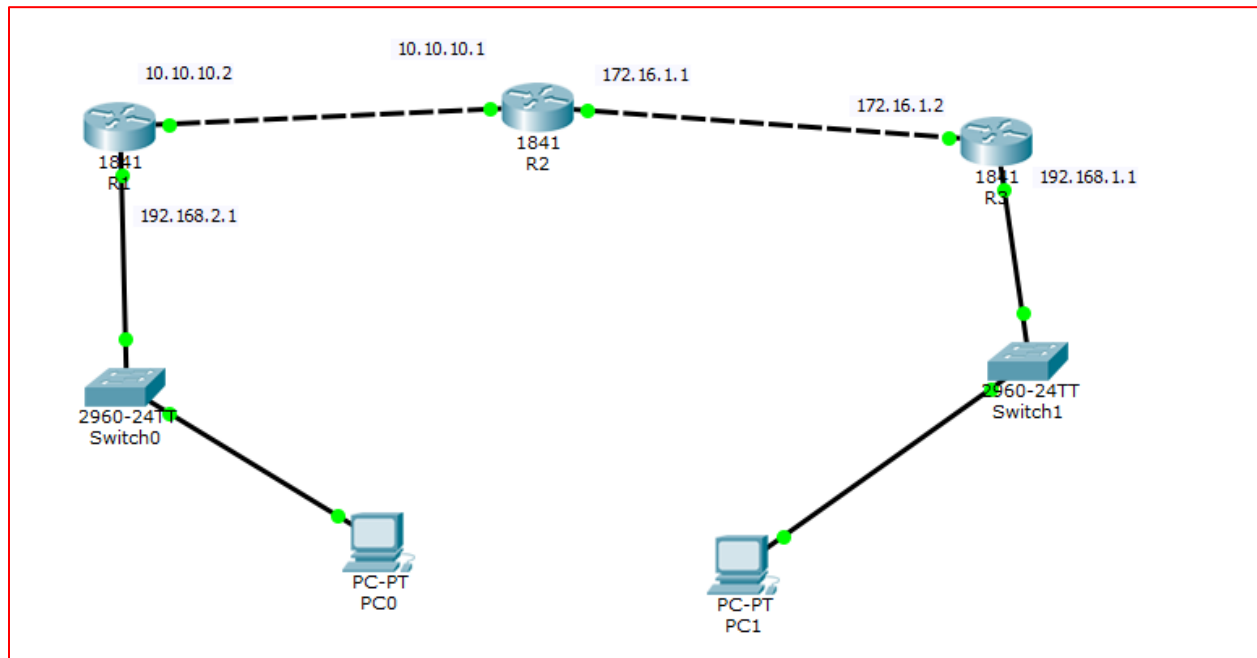
```
R1(config)#ip route 192.168.1.0 255.255.255.252 10.10.10.1
```



```
R2(config)#ip route 192.168.2.0 255.255.255.255 10.10.10.2
```

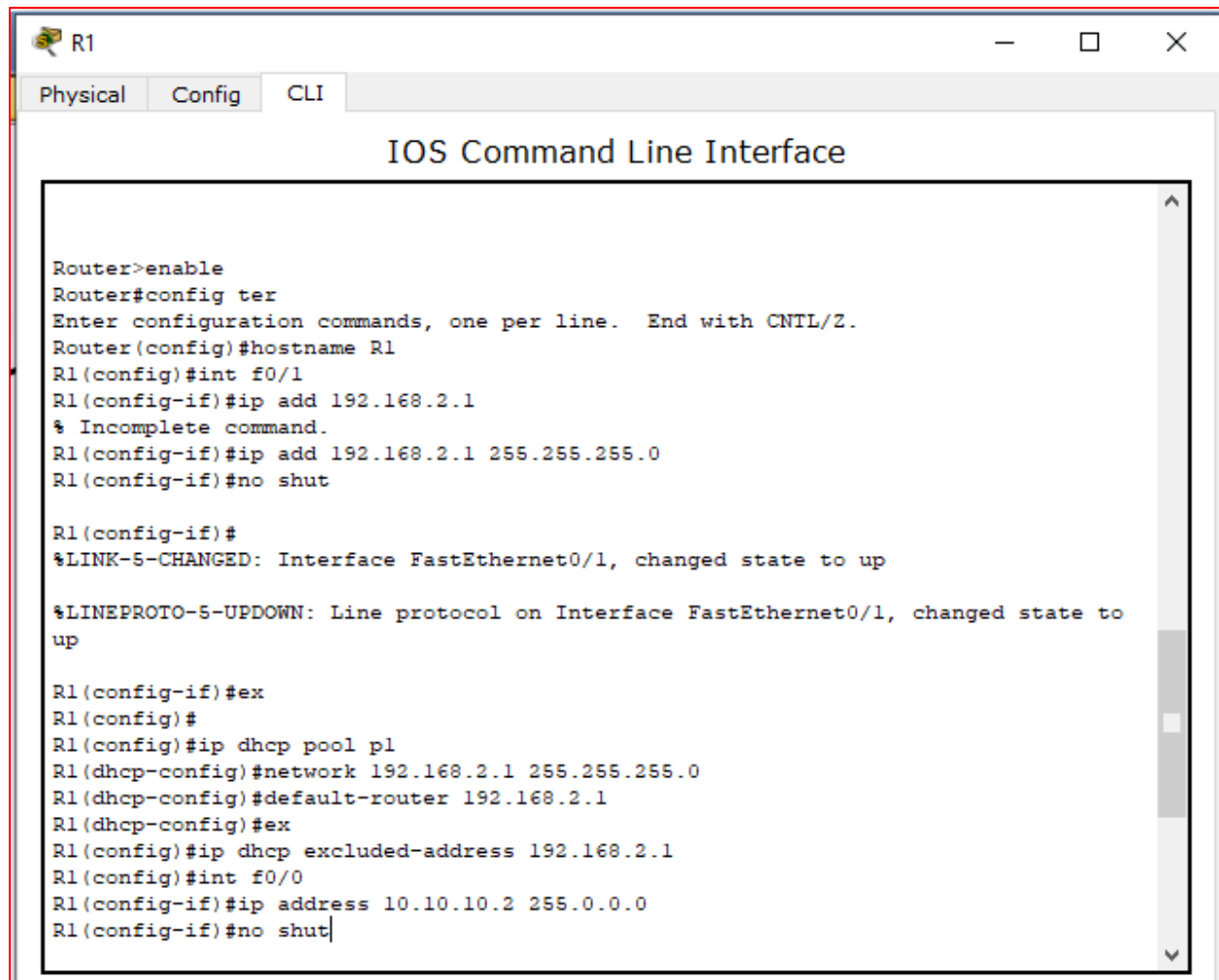
The screenshot shows a configuration window for a device named R2. The window has three tabs: Physical, Config, and CLI. The Config tab is active, and the left sidebar shows a tree view with categories: GLOBAL, ROUTING, SWITCHING, and INTERFACE. Under ROUTING, 'Static' is selected. The main area is titled 'Static Routes' and contains input fields for 'Network', 'Mask', and 'Next Hop', followed by an 'Add' button. Below this, a list of configured static routes is shown under the heading 'Network Address'. The list contains two entries: '192.168.2.0/24 via 10.10.10.2' and '192.168.2.0/30 via 10.10.10.2'. A 'Remove' button is located at the bottom right of the list. At the bottom of the window, a section titled 'Equivalent IOS Commands' displays the following commands in a text area:

```
Router(config)#ip route 192.168.2.0 255.255.255.0 10.10.10.2
Router(config)#ip route 192.168.2.0 255.255.255.255 10.10.10.2
Router(config)#no Router(config)#ip route 192.168.2.0 255.255.255.255 10.10.10.2
```

Static Routing (connect 3 Routers):

Router 1 Configuration

```
Router>enable
Router#config ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#int f0/1
R1(config-if)#ip add 192.168.2.1 255.255.255.0
R1(config-if)#no shut
R1(config-if)#ex
R1(config)#ip dhcp pool p1
R1(dhcp-config)#network 192.168.2.1 255.255.255.0
R1(dhcp-config)#default-router 192.168.2.1
R1(dhcp-config)#ex
R1(config)#ip dhcp excluded-address 192.168.2.1
R1(config)#int f0/0
R1(config-if)#ip address 10.10.10.2 255.0.0.0
R1(config-if)#no shut
```

```
Router>enable
Router#config ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#int f0/1
R1(config-if)#ip add 192.168.2.1
% Incomplete command.
R1(config-if)#ip add 192.168.2.1 255.255.255.0
R1(config-if)#no shut

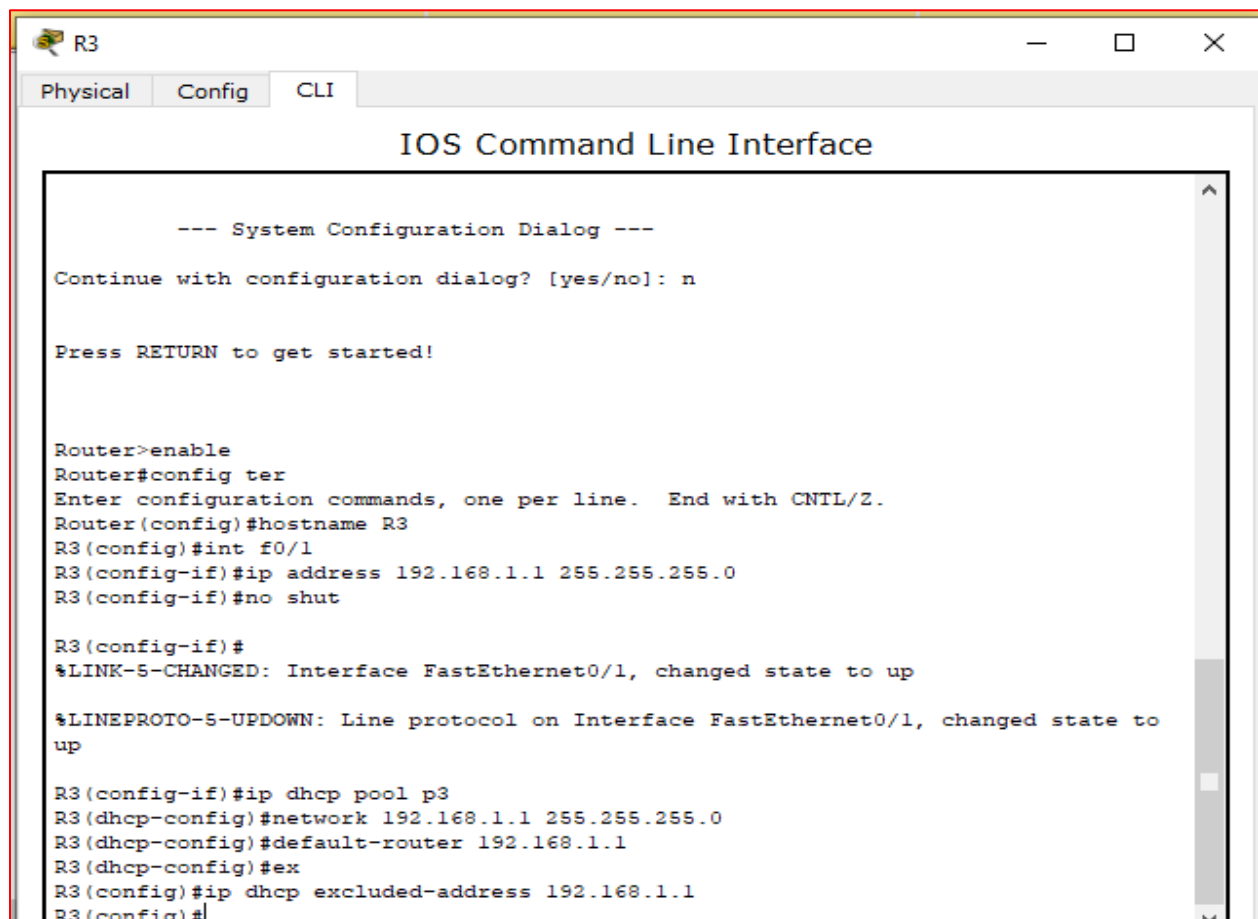
R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
up

R1(config-if)#ex
R1(config)#
R1(config)#ip dhcp pool p1
R1(dhcp-config)#network 192.168.2.1 255.255.255.0
R1(dhcp-config)#default-router 192.168.2.1
R1(dhcp-config)#ex
R1(config)#ip dhcp excluded-address 192.168.2.1
R1(config)#int f0/0
R1(config-if)#ip address 10.10.10.2 255.0.0.0
R1(config-if)#no shut|
```

Router 3 Configuration

```
Router>enable
Router#config ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R3
R3(config)#int f0/1
R3(config-if)#ip address 192.168.1.1 255.255.255.0
R3(config-if)#no shut
R3(config-if)#ip dhcp pool p3
R3(dhcp-config)#network 192.168.1.1 255.255.255.0
R3(dhcp-config)#default-router 192.168.1.1
```



The screenshot shows a window titled 'R3' with three tabs: 'Physical', 'Config', and 'CLI'. The 'CLI' tab is active, displaying the 'IOS Command Line Interface'. The interface shows a 'System Configuration Dialog' with a prompt to continue with configuration (answered 'n'). It then shows the user entering 'enable' to reach the 'Router#' prompt, followed by 'config ter' to enter configuration mode. The user then configures the router's hostname to 'R3', enables interface 'f0/1', and assigns it the IP address '192.168.1.1' with a subnet mask of '255.255.255.0'. Status messages confirm the interface is up and the line protocol is up. Finally, a DHCP pool named 'p3' is configured with the same network and mask, the default router is set to '192.168.1.1', and the IP address '192.168.1.1' is excluded from the pool. The prompt returns to 'R3(config)#'.

```
--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n

Press RETURN to get started!

Router>enable
Router#config ter
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R3
R3(config)#int f0/1
R3(config-if)#ip address 192.168.1.1 255.255.255.0
R3(config-if)#no shut

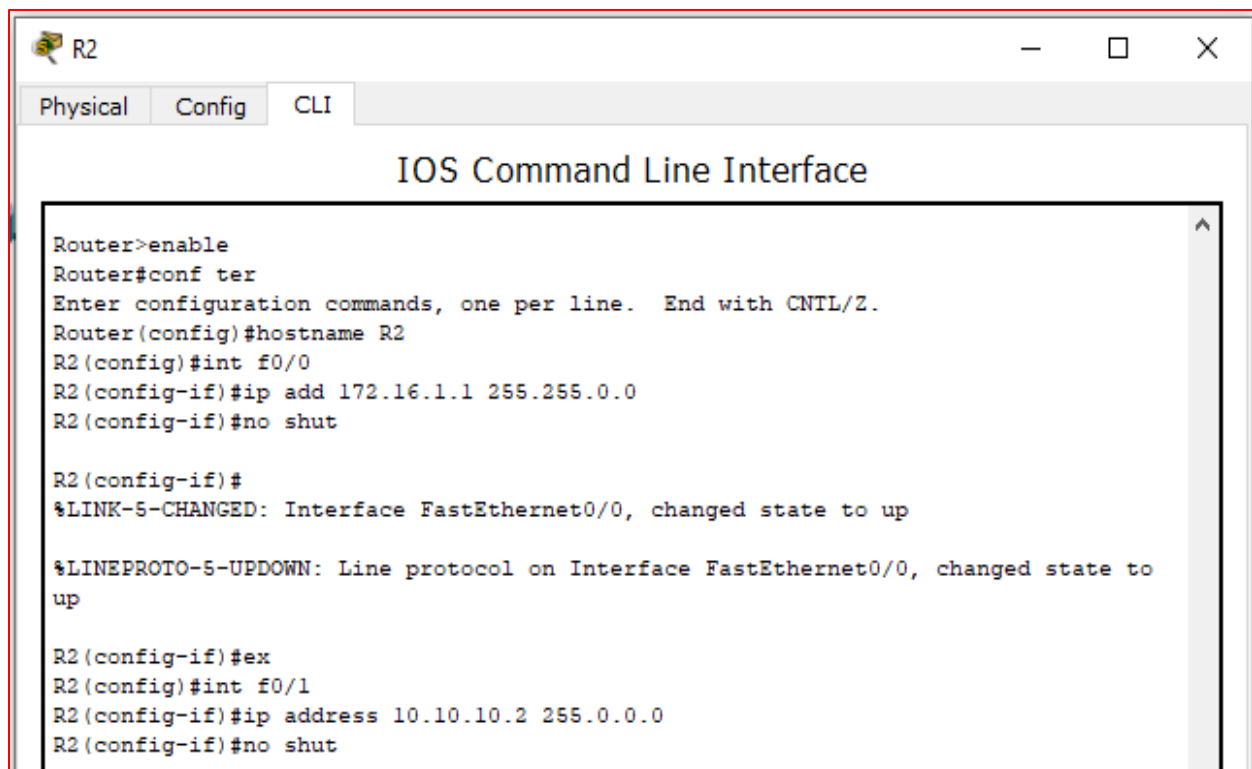
R3(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to
up

R3(config-if)#ip dhcp pool p3
R3(dhcp-config)#network 192.168.1.1 255.255.255.0
R3(dhcp-config)#default-router 192.168.1.1
R3(dhcp-config)#ex
R3(config)#ip dhcp excluded-address 192.168.1.1
R3(config)#
```

Router 2 Configuration

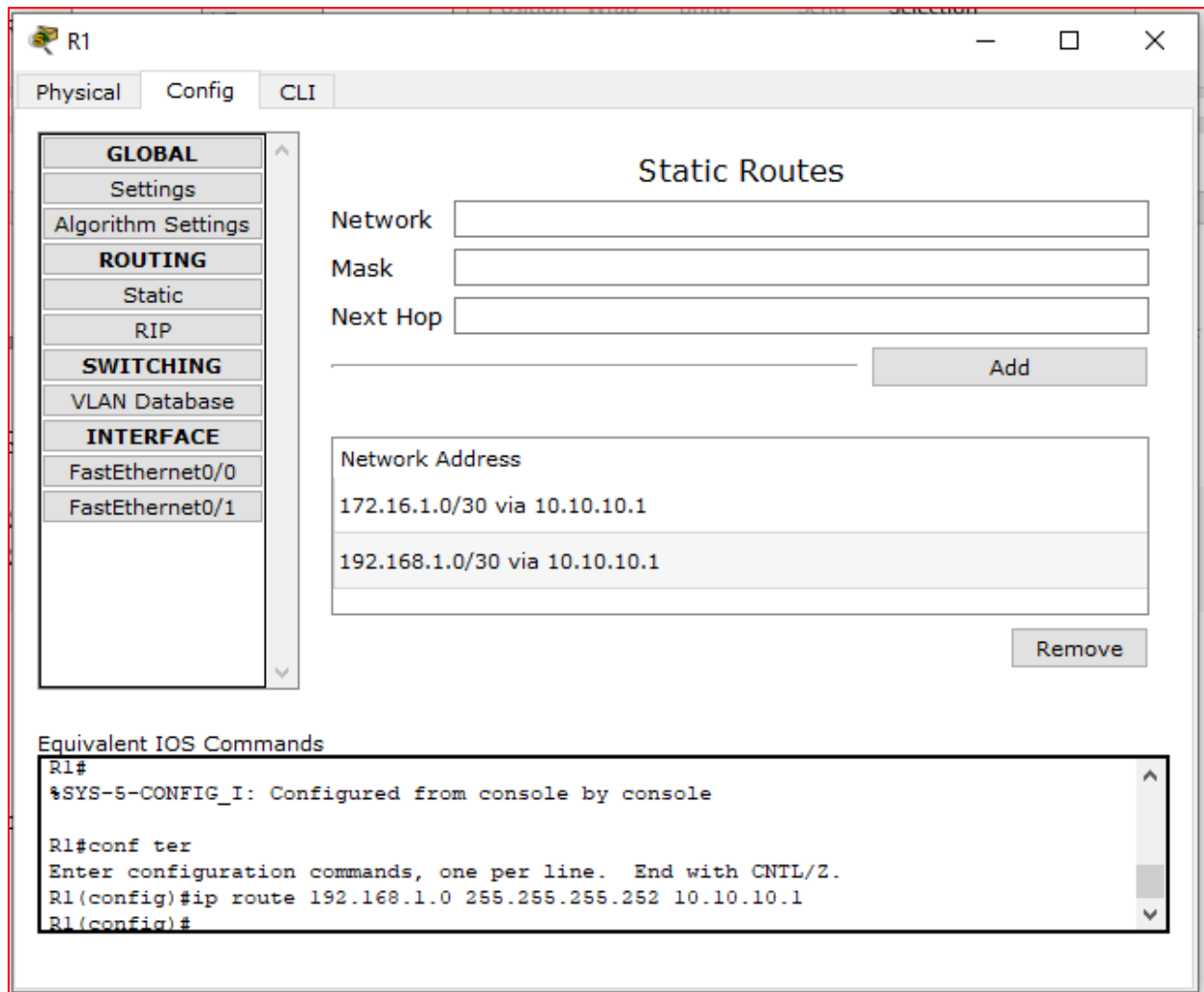
```
Router>enable
Router#conf ter
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#int f0/0
R2(config-if)#ip add 172.16.1.1 255.255.0.0
R2(config-if)#no shut
R2(config-if)#ex
```



IP Route in R1:

```
R1(config)#ip route 172.16.1.0 255.255.255.252 10.10.10.1
```

```
R1(config)#ip route 192.168.1.0 255.255.255.252 10.10.10.1
```

**IP Route in R2:**

```
R2(config)#ip route 192.168.2.0 255.255.255.0 10.10.10.2
```

```
R2(config)#ip route 192.168.1.0 255.255.255.0 172.16.1.2
```

The screenshot shows the configuration window for router R2. The 'CLI' tab is selected. On the left, a sidebar contains a tree view with categories: GLOBAL (Settings, Algorithm Settings), ROUTING (Static, RIP), SWITCHING (VLAN Database), and INTERFACE (FastEthernet0/0, FastEthernet0/1). The 'Static' option under ROUTING is selected. The main area is titled 'Static Routes' and contains three input fields: 'Network', 'Mask', and 'Next Hop'. Below these fields is an 'Add' button. A table below the 'Add' button lists configured static routes:

Network Address
192.168.2.0/24 via 10.10.10.2
192.168.1.0/24 via 172.16.1.2

Below the table is a 'Remove' button. At the bottom, a section titled 'Equivalent IOS Commands' shows a text area with the following commands:

```
R2(config)#ip route 192.168.1.0 255.255.255.0 172.16.1.2
R2(config)#
R2(config)#
R2(config)#
R2(config)#
R2(config)#
```

IP Route in R3:

```
R3(config)#ip route 10.10.10.0 255.255.255.0 172.16.1.1
```

```
R3(config)#ip route 192.168.2.0 255.255.255.0 172.16.1.1
```

The screenshot shows a web-based configuration interface for a device labeled 'R3'. The interface has three tabs: 'Physical', 'Config', and 'CLI'. The 'Config' tab is active, and a left-hand sidebar contains a tree view with categories: GLOBAL, ROUTING, SWITCHING, and INTERFACE. Under 'ROUTING', 'Static' is selected. The main area is titled 'Static Routes' and contains input fields for 'Network', 'Mask', and 'Next Hop', followed by an 'Add' button. Below this, a table lists configured static routes. The table has one column, 'Network Address', and contains two entries: '10.10.10.0/24 via 172.16.1.1' and '192.168.2.0/24 via 172.16.1.1'. A 'Remove' button is located at the bottom right of the table. At the bottom of the interface, a section titled 'Equivalent IOS Commands' displays a list of commands in a text area.

Static Routes

Network

Mask

Next Hop

Network Address
10.10.10.0/24 via 172.16.1.1
192.168.2.0/24 via 172.16.1.1

Equivalent IOS Commands

```
%Inconsistent address and mask
R3(config)#ip route 10.10.10.0 255.255.255.0 172.16.1.1
R3(config)#ip route 192.168.2.0 255.255.255.0 172.16.1.1
R3(config)#ip route 168.168.2.0 255.255.255.0 10.10.10.0
```

