

HACETTEPE UNIVERSITY  
COMPUTER ENGINEERING DEPARTMENT  
COMPUTER NETWORKS LABORATORY



EXPERIMENT  
Dynamic Routing

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Group No:12

## AIM OF EXPERIMENT:

In this lab experiment, we learned how to work with dynamic routing protocols by adding to and testing on the topology we created on Routing experiment.

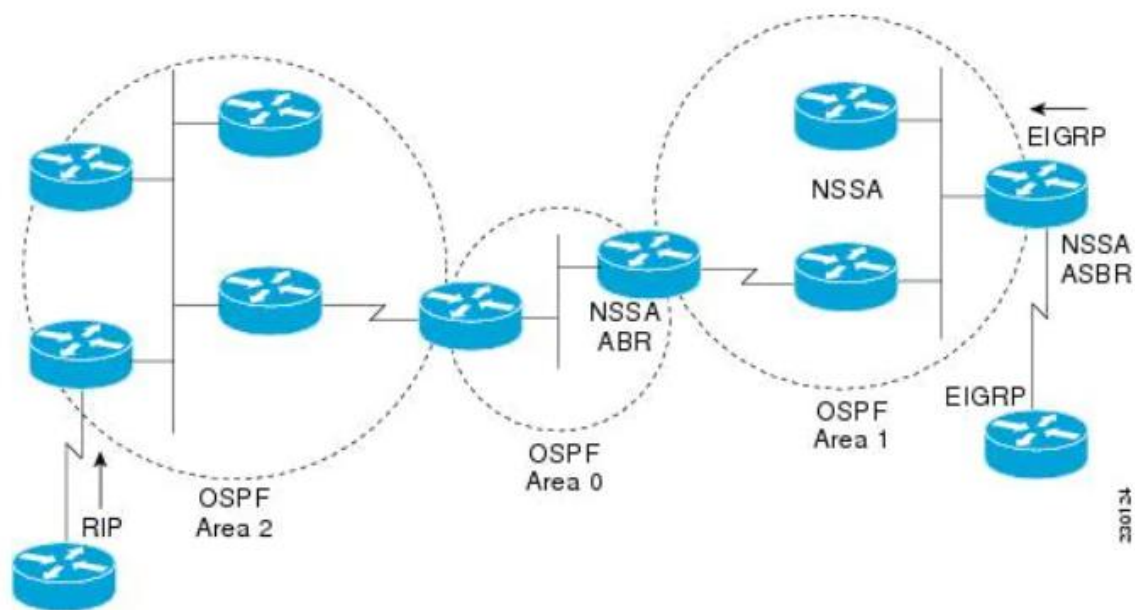
## DEFINITIONS AND EXPLANATIONS:

**IP ROUTING RIP CONFIGURATION:** RIP (Routing Information Protocol) uses hop count as the measurement to find the different routers' values. In RIP directly connected devices' count is zero and too far away networks' count is 16 because there is a limitation for too far away networks, RIP is not convenient for large networks. The RIP uses UDP packets to exchange information about routing.

**IP ROUTING OSPF CONFIGURATION:** OSPF (Open Shortest Path First) was found by IETF (Internet Engineering Task Force). OSPF supports IP subnetting and packet authentication. OSPF also requires the coordination of inner routers some of which are connected to multiple routers.

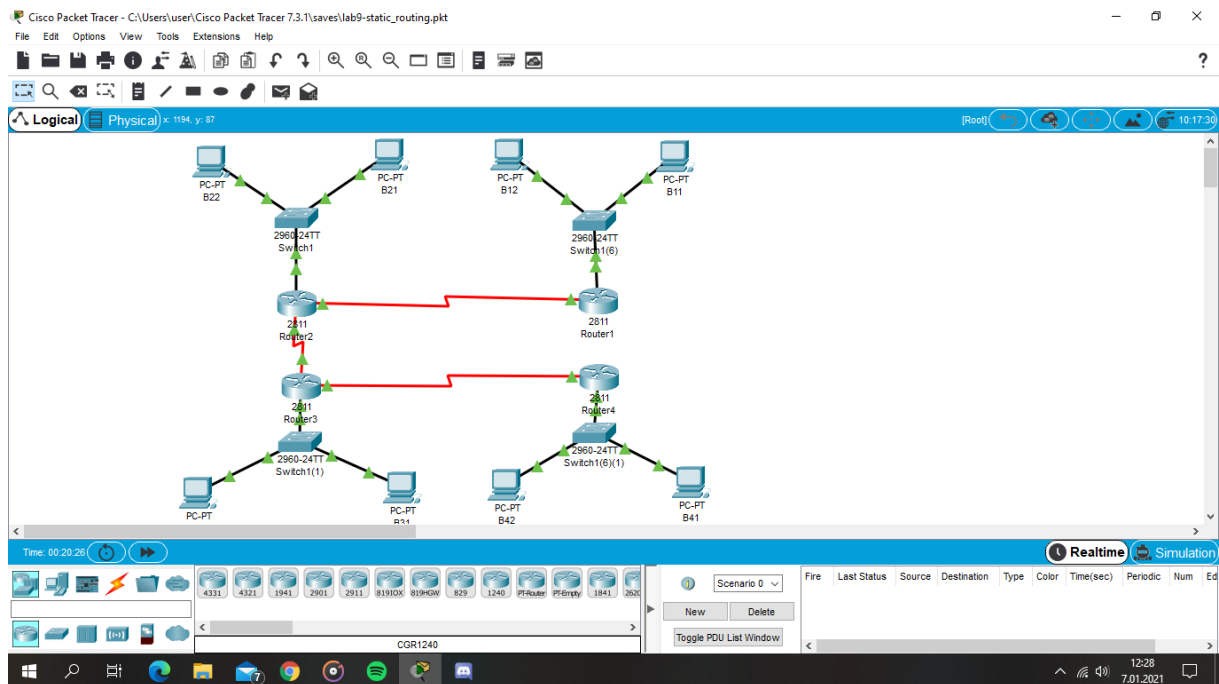
**IP ROUTING EIGRP CONFIGURATION:** EIGRP (Enhanced Interior Gateway Routing Protocol) is based on Diffuse Update Algorithm which is an algorithm that lets all of the devices in the topology to synchronize.

Figure 1. OSPF NSSA

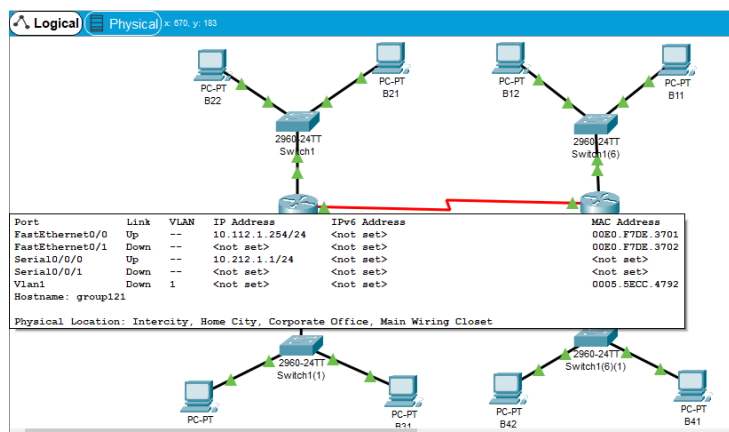


[1]. Figure reference: [https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/iproute\\_ospf/configuration/xr-16/iro-xe-16-book/iro-cfg.html](https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/iproute_ospf/configuration/xr-16/iro-xe-16-book/iro-cfg.html)

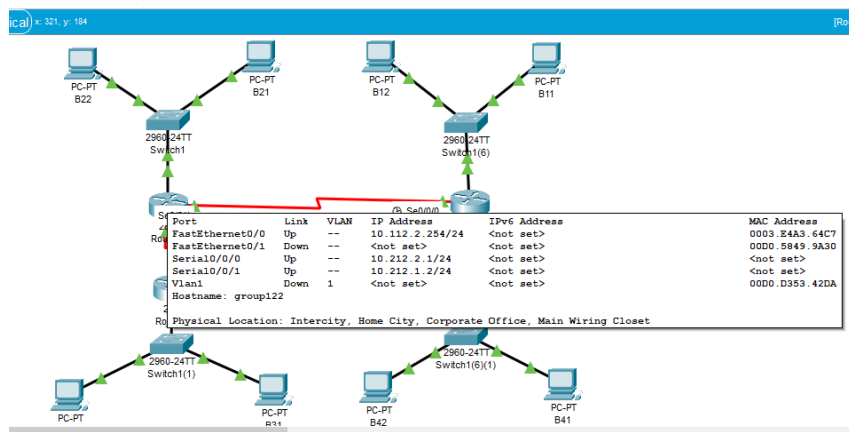
# STEPS TAKEN:



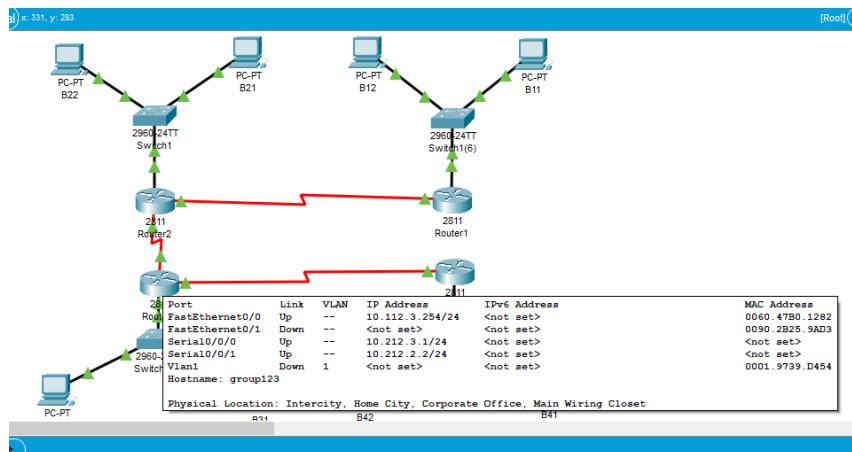
Topology



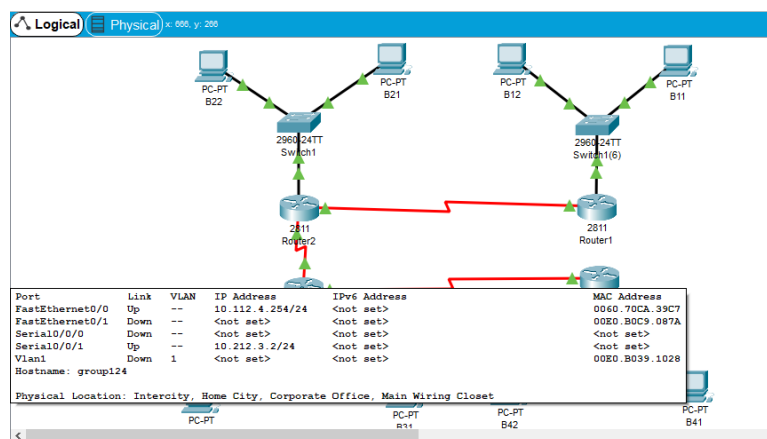
Router 1 interface



Router 2 interface

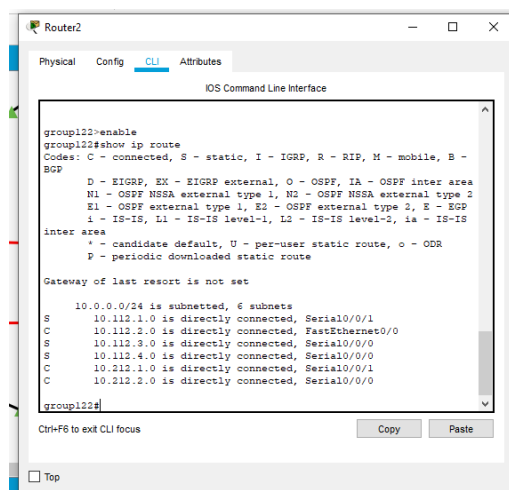


Router 3 interface

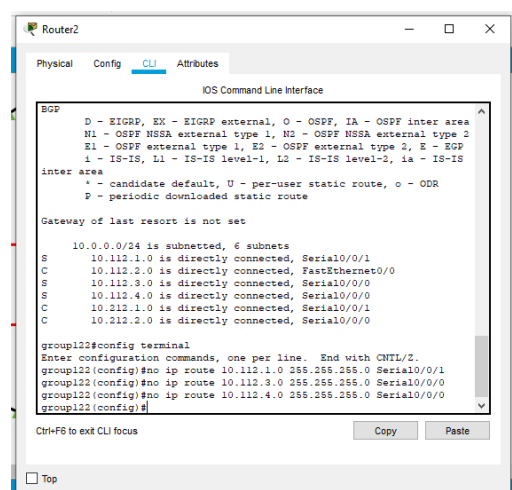


Router 4 interface

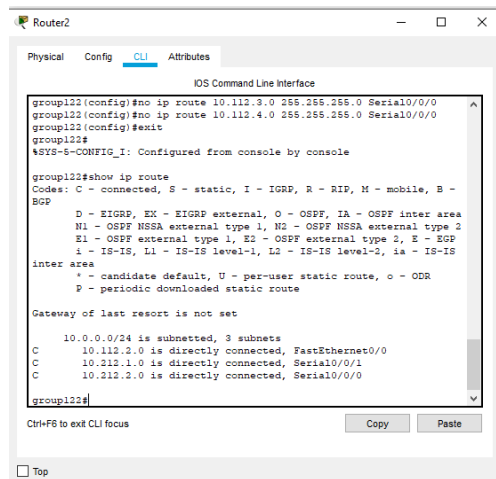
Deleted the static routing. For example:



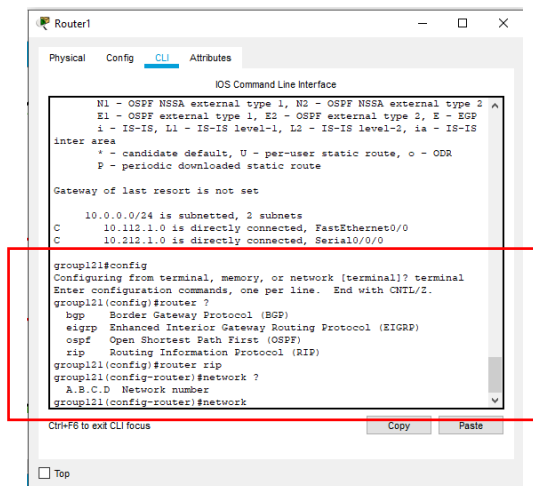
Router 2 before configuration deletion



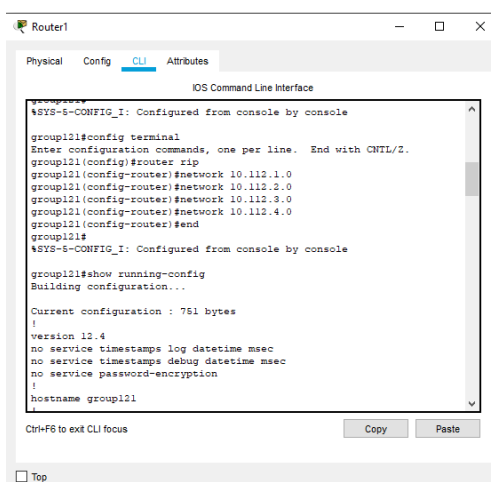
Router 2 after configuration deletion



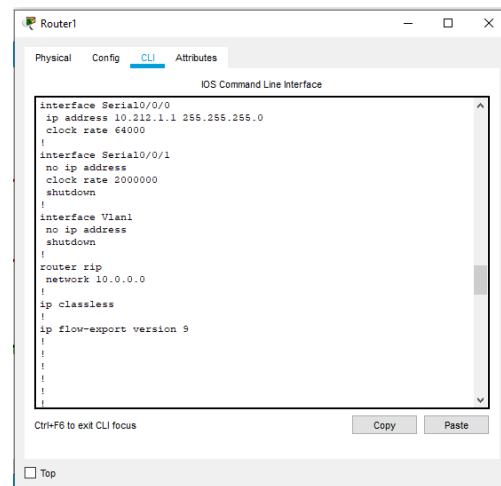
The Show IP route after deletion



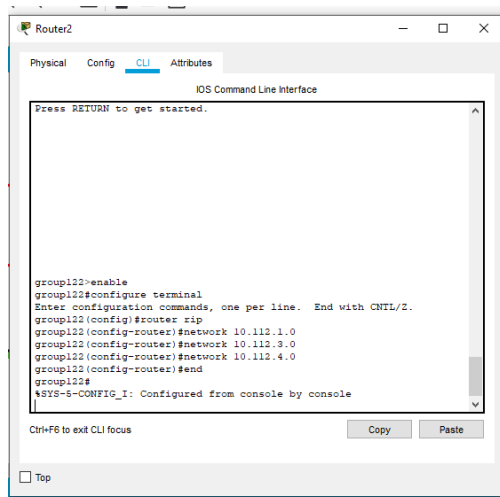
Config command



Router 1 RIP configuration



Router 1 show running-config command



Router2

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Press RETURN to get started.

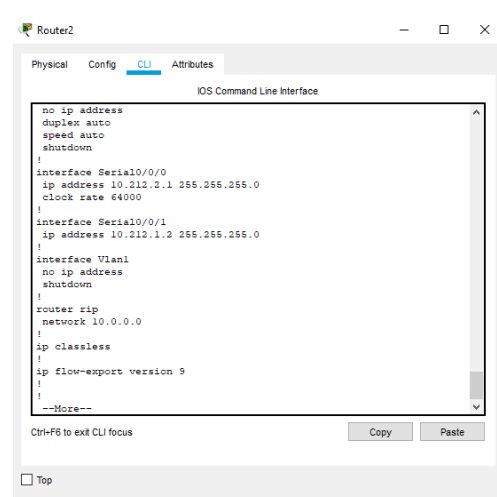
group12>enable
group12#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group12(config)#router rip
group12(config-router)#network 10.112.1.0
group12(config-router)#network 10.112.3.0
group12(config-router)#network 10.112.4.0
group12(config-router)#end
group12#
%SYS-5-CONFIG_I: Configured from console by console

Ctrl+F6 to exit CLI focus
```

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Router 2 RIP configuration



Router2

Physical Config **CLI** Attributes

IOS Command Line Interface

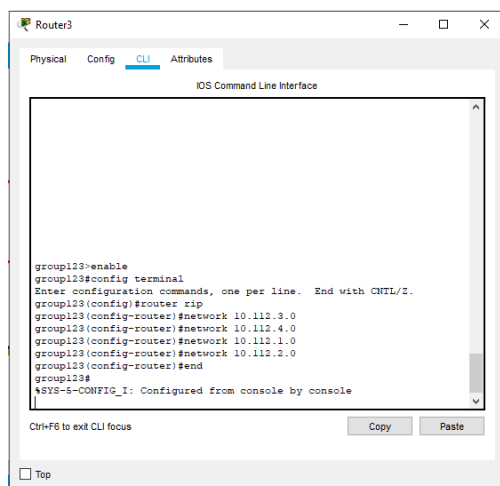
```
no ip address
duplex auto
speed auto
shutdown
!
interface Serial10/0/0
ip address 10.212.2.1 255.255.255.0
clock rate 64000
!
interface Serial10/0/1
ip address 10.212.1.2 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router rip
network 10.0.0.0
!
ip classless
ip flow-export version 9
!
!
!
--More--

Ctrl+F6 to exit CLI focus
```

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Router 2 show running-config command



Router3

Physical Config **CLI** Attributes

IOS Command Line Interface

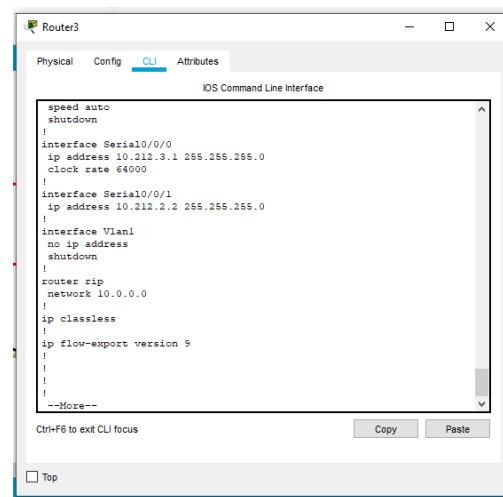
```
group123>enable
group123#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group123(config)#router rip
group123(config-router)#network 10.112.3.0
group123(config-router)#network 10.112.4.0
group123(config-router)#network 10.112.1.0
group123(config-router)#network 10.112.2.0
group123(config-router)#end
group123#
%SYS-5-CONFIG_I: Configured from console by console

Ctrl+F6 to exit CLI focus
```

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Router 3 RIP configuration



Router3

Physical Config **CLI** Attributes

IOS Command Line Interface

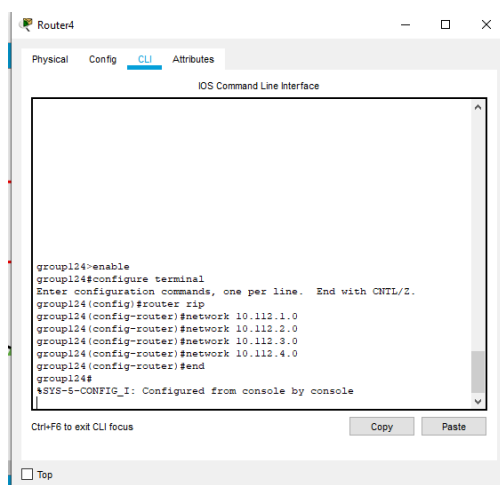
```
speed auto
shutdown
!
interface Serial10/0/0
ip address 10.212.3.1 255.255.255.0
clock rate 64000
!
interface Serial10/0/1
ip address 10.212.2.2 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router rip
network 10.0.0.0
!
ip classless
ip flow-export version 9
!
!
!
--More--

Ctrl+F6 to exit CLI focus
```

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Router 3 show running-config command



Router4

Physical Config **CLI** Attributes

IOS Command Line Interface

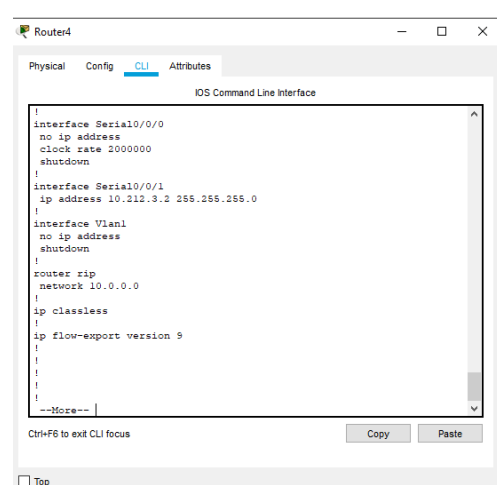
```
group124>enable
group124#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group124(config)#router rip
group124(config-router)#network 10.112.1.0
group124(config-router)#network 10.112.3.0
group124(config-router)#network 10.112.4.0
group124(config-router)#end
group124#
%SYS-5-CONFIG_I: Configured from console by console

Ctrl+F6 to exit CLI focus
```

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Router 4 RIP configuration



Router4

Physical Config **CLI** Attributes

IOS Command Line Interface

```
!
interface Serial10/0/0
no ip address
clock rate 2000000
shutdown
!
interface Serial10/0/1
ip address 10.212.3.2 255.255.255.0
!
interface Vlan1
no ip address
shutdown
!
router rip
network 10.0.0.0
!
ip classless
ip flow-export version 9
!
!
!
--More--

Ctrl+F6 to exit CLI focus
```

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Router 4 show running-config command

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface
Press RETURN to get started.

group121>enable
group121#ping 10.112.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.112.3.3, timeout is 2 seconds:
!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/1/1 ms
group121#
```

Ping from r1 to b22

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface
group121>enable
group121#ping 10.112.2.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.112.2.3, timeout is 2 seconds:
!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/1/1 ms
group121#ping 10.112.4.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.112.4.2, timeout is 2 seconds:
!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 3/6/11 ms
group121#ping 10.112.4.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.112.4.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/5/12 ms
group121#
```

Ping from r1 to b41

Our wildcard mask:

255.255.255.255 – 255.255.255.0 (our subnet mask) = 0.0.0.255

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface
Sending 5, 100-byte ICMP Echos to 10.112.4.2, timeout is 2 seconds:
!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 3/6/11 ms
group121#ping 10.112.4.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.112.4.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/5/12 ms
group121#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group121(config)#no router rip
group121(config)#exit
group121#
%SYS-5-CONFIG_I: Configured from console by console
group121#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group121(config)#router ospf 1
group121(config-router)#network 10.112.2.0 0.0.0.255 area 0
group121(config-router)#network 10.112.3.0 0.0.0.255 area 0
group121(config-router)#network 10.112.4.0 0.0.0.255 area 0
group121(config-router)#end
group121#
```

Router 1 OSPF configuration

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface
Minimum LSA interval 5 secs, Minimum LSA arrival 1 secs
Number of external LSA 0, Checksum Sum 0x000000
Number of opaque AS LSA 0, Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
Area BACKBONE(0) (Inactive)
Number of interfaces in this area is 0
Area has no authentication
SPF algorithm executed 1 times
Area ranges are
Number of LSA 1, Checksum Sum 0x00fda5
Number of opaque link LSA 0, Checksum Sum 0x000000
Number of DCbitless LSA 0
Number of indication LSA 0
Number of DoNotAge LSA 0
Flood list length 0
group121#show ip ospf border-routers
OSPF Process 1 Internal Routing Table
Codes: i - Intra-area route, I - Inter-area route
group121#
```

Router 1 show ip ospf border-routers command (routing table)

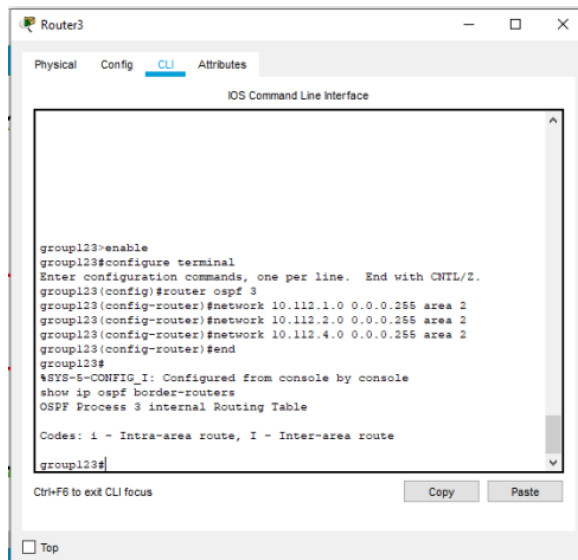
```
Router2
Physical Config CLI Attributes
IOS Command Line Interface
Press RETURN to get started.

group122>enable
group122#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group122(config)#router ospf 3
group122(config-router)#network 10.112.1.0 0.0.0.255 area 1
group122(config-router)#network 10.112.3.0 0.0.0.255 area 1
group122(config-router)#network 10.112.4.0 0.0.0.255 area 1
group122(config-router)#end
group122#
%SYS-5-CONFIG_I: Configured from console by console
```

Router 2 OSPF configuration

```
Router2
Physical Config CLI Attributes
IOS Command Line Interface
Minimum LSA interval 5 secs, Minimum LSA arrival 1 secs
Number of external LSA 0, Checksum Sum 0x000000
Number of opaque AS LSA 0, Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
Area 1
Number of interfaces in this area is 0
Area has no authentication
SPF algorithm executed 1 times
Area ranges are
Number of LSA 1, Checksum Sum 0x00ebb5
Number of opaque link LSA 0, Checksum Sum 0x000000
Number of DCbitless LSA 0
Number of indication LSA 0
Number of DoNotAge LSA 0
Flood list length 0
group122#show ip ospf border-routers
OSPF Process 3 Internal Routing Table
Codes: i - Intra-area route, I - Inter-area route
group122#
```

Router 2 show ip ospf border-routers command (routing table)

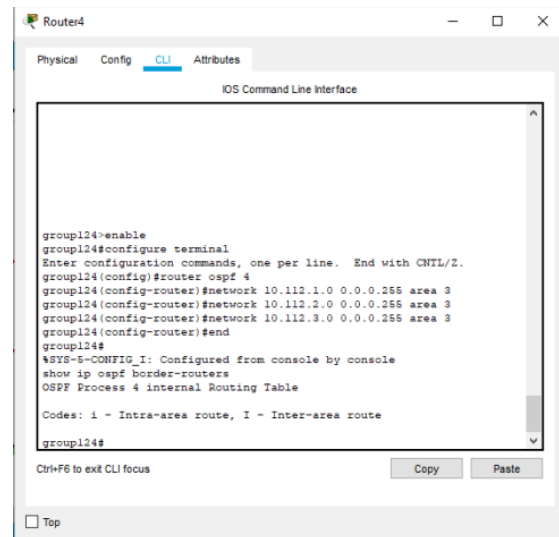


```
Router3
Physical Config CLI Attributes
IOS Command Line Interface

group123>enable
group123#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group123(config)#router ospf 3
group123(config-router)#network 10.112.1.0 0.0.0.255 area 2
group123(config-router)#network 10.112.2.0 0.0.0.255 area 2
group123(config-router)#network 10.112.4.0 0.0.0.255 area 2
group123(config-router)#end
group123#
%SYS-5-CONFIG_I: Configured from console by console
show ip ospf border-routers
OSPF Process 3 internal Routing Table

Codes: i - Intra-area route, I - Inter-area route
group123#
```

**Router 3 OSPF configuration and show  
ip ospf border-routers command (routing table)**

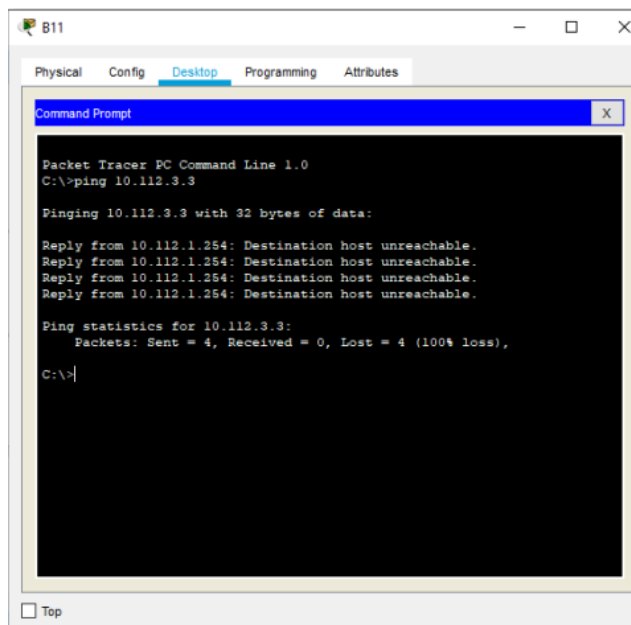


```
Router4
Physical Config CLI Attributes
IOS Command Line Interface

group124>enable
group124#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group124(config)#router ospf 4
group124(config-router)#network 10.112.1.0 0.0.0.255 area 3
group124(config-router)#network 10.112.2.0 0.0.0.255 area 3
group124(config-router)#network 10.112.3.0 0.0.0.255 area 3
group124(config-router)#end
group124#
%SYS-5-CONFIG_I: Configured from console by console
show ip ospf border-routers
OSPF Process 4 internal Routing Table

Codes: i - Intra-area route, I - Inter-area route
group124#
```

**Router 4 OSPF configuration and show  
ip ospf border-routers command (routing table)**



```
B11
Physical Config Desktop Programming Attributes
Command Prompt

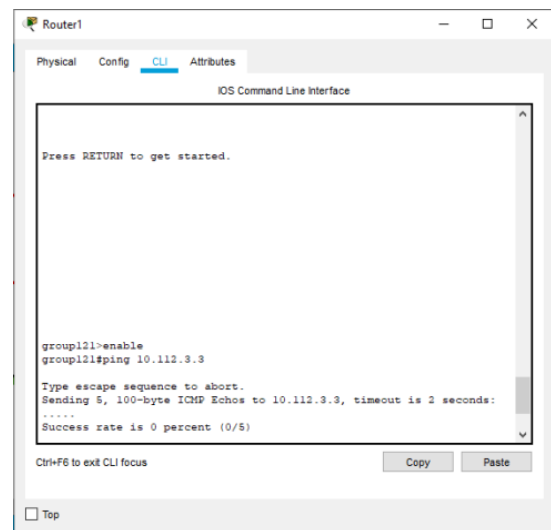
Packet Tracer PC Command Line 1.0
C:\>ping 10.112.3.3

Pinging 10.112.3.3 with 32 bytes of data:

Reply from 10.112.1.254: Destination host unreachable.
Reply from 10.112.1.254: Destination host unreachable.
Reply from 10.112.1.254: Destination host unreachable.
Reply from 10.112.1.254: Destination host unreachable.

Ping statistics for 10.112.3.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

**Ping from b11 to b33**



```
Router1
Physical Config CLI Attributes
IOS Command Line Interface

Press RETURN to get started.

group121>enable
group121#ping 10.112.3.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.112.3.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

Ctrl+F6 to exit CLI focus
```

**ping from r1 to b33**



```
Router1
Physical Config CLI Attributes
IOS Command Line Interface

group121#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group121(config)#router eigrp 12
group121(config-router)#network 10.112.2.0 0.0.0.255
group121(config-router)#exit
group121(config)#exit
group121#
%SYS-5-CONFIG_I: Configured from console by console
show run
Building configuration...

Current configuration : 782 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname group121
!
!
!
```

```
Router2
Physical Config CLI Attributes
IOS Command Line Interface

Press RETURN to get started.

group122#enable
group122#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group122(config)#router eigrp 12
group122(config-router)#network 10.112.1.0 0.0.0.255
group122(config-router)#network 10.112.3.0 0.0.0.255
group122(config-router)#exit
group122(config)#exit
group122#
%SYS-5-CONFIG_I: Configured from console by console
```

```

speed auto
shutdown
!
interface Serial0/0/0
ip address 10.212.1.1 255.255.255.0
clock rate 4000
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router eigrp 12
network 10.112.2.0 0.0.0.255
auto-summary
!
ip classless
!
ip flow-export version 9
!
--More--
```

```

!
interface Vlan1
no ip address
shutdown
!
router eigrp 12
network 10.112.1.0 0.0.0.255
network 10.112.3.0 0.0.0.255
auto-summary
!
ip classless
!
ip flow-export version 9
!
!
!
!
line con 0
!
line aux 0
!
!
```

**Router 1 EIGRP configuration and show run command**

**Router 1 EIGRP configuration and show run command**

```
Router3
Physical Config CLI Attributes
IOS Command Line Interface

Press RETURN to get started.

group123#enable
group123#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group123(config)#router eigrp 12
group123(config-router)#network 10.112.2.0 0.0.0.255
group123(config-router)#network 10.112.4.0 0.0.0.255
group123(config-router)#exit
group123(config)#exit
group123#
%SYS-5-CONFIG_I: Configured from console by console
```

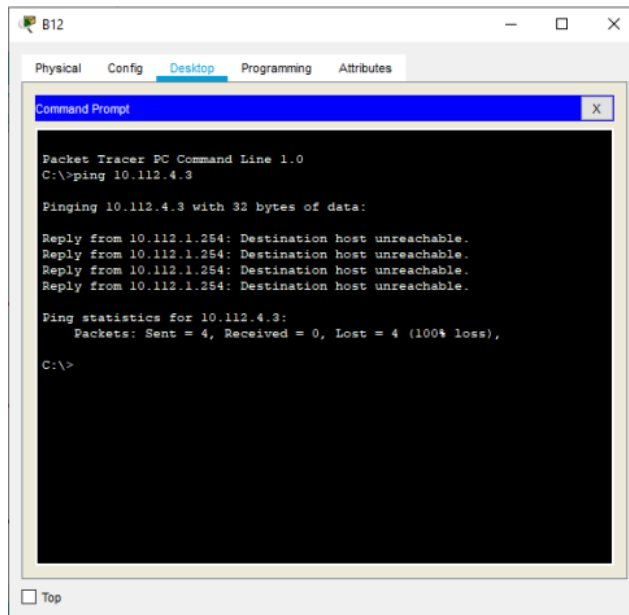
```
Router4
Physical Config CLI Attributes
IOS Command Line Interface

Press RETURN to get started.

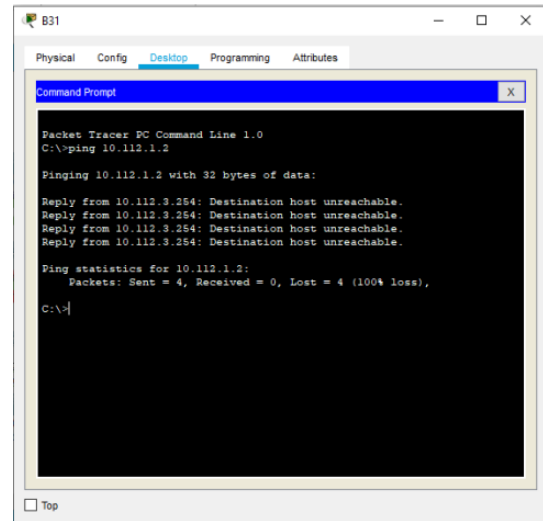
group124#enable
group124#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
group124(config)#router eigrp 12
group124(config-router)#network 10.112.3.0 0.0.0.255
group124(config-router)#exit
group124(config)#exit
group124#
%SYS-5-CONFIG_I: Configured from console by console
```

**Router 2 EIGRP configuration and show run command**

**Router 2 EIGRP configuration and show run command**



**Ping from b12 to b42**



**ping from b31 to b11**