LAB 3 - Static routes

Routing is the process used by the router to forward packets toward the destination network. The router makes decisions based on the packet destination IP address. The knowledge of methods to reach remote networks stands the condition for making the right decisions for routers. When using static routing, network administrator manually configures information about remote networks. This approach is the subject of the exercise.

Ragarding to the fact, that static routes are configured manually, the administrator ought to add and delete them to reflect changes of the network topology. In case of the large networks, routing tables manual configuration can be time-consuming. In small networks where possible changes are minor, maintaining static routes is quite effective. Please note that even in large networks, static routes, having assigned a specific task are often configured in conjunction with the dynamic routing protocol.

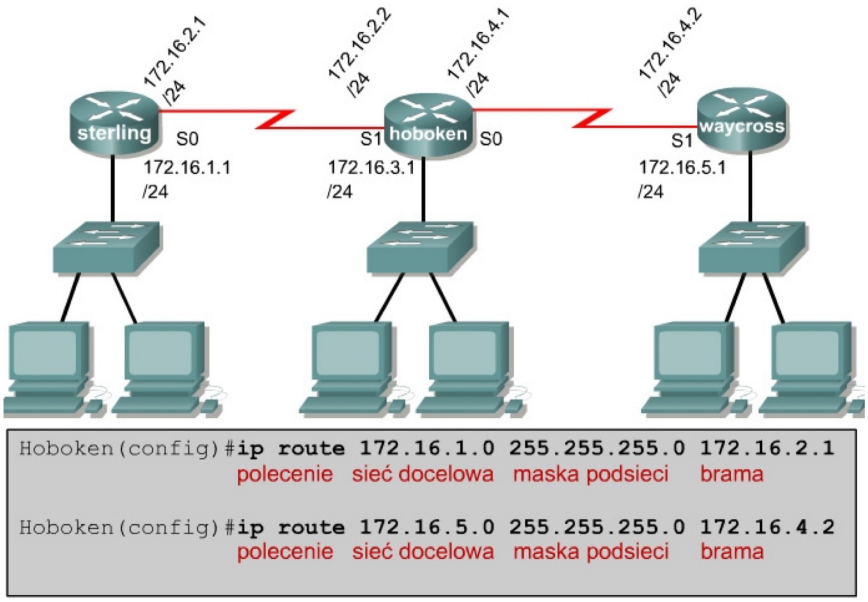
Static routes

Activities related to the static routes can be divided into three stages:

- the network administrator configures the route
- router installs the route in the routing table,
- static route is used for routing packets.

To manually configure a static route the following command is used: *ip route*.
The correct syntax can take one of two forms as discussed below.

A static route using the address of the next hop



In the picture above, a static route ought to be configured to the network 172.16.1.0/24 and 172.16.5.0/24 other routers for a router Hoboken network. To do this, enter a command indicating the IP address of the next hop to the neighour router.

Command syntax:

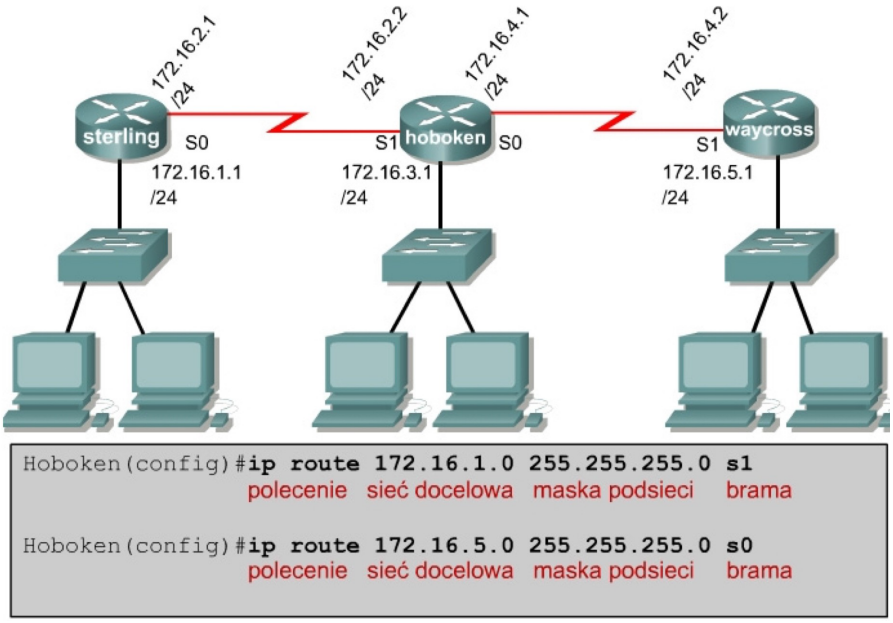
Router(config)# ip route network-address subnet-mask ip-address

where

- network-address —destination network address of the target, to be added to the routing table.
- subnet-mask — the subnet mask of the destination network to be added to the table The subnet mask can be modified to summarize a group of networks.
- ip-address — The next hop router IP address.

his command will install a static route in the routing table of the router Hoboken.

A static route using outgoing interface



In this case, the method of configuring a static route (shown in the figure above) is to specify the name of the interface as a gateway for the route - in the routing table the entry will be marked as **directly connected**.

Command syntax:
Router(config)# ip route network-address subnet-mask exit-interface
where

- network-address —destination network address of the target, to be added to the routing table.
- subnet-mask — the subnet mask of the destination network to be added to the table The subnet mask can be modified to summarize a group of networks.
- exit-interface — outgoing interface that will be used to send packets to the destination network.

The practice of configuring static routes

In order to configure static routes, perform the following steps:

1. Determine the destination networks, the subnet masks and gateways. Gateway can be either a local interface, as well as the address of the next hop leading to a neighboring router.
2. Enter global configuration mode.
3. Enter the *ip route* command with prefix and a mask, and the address specified in step 1. You can optionally configure the administrative distance (this topic is the subject of homework). Repeat step 3 for all destination networks, defined in step 1.
4. Leave global configuration mode.
5. Make sure, that the static route is in the routing table using *show ip route* command.

Default route configuration

Default routes are used for routing packets whose destination addresses do not correspond to any routes in the routing table. Routers are typically configured static route for traffic from the Internet, because the maintenance of routes to all networks on the Internet is impractical or simply impossible. The default route is actually a special static route in accordance with the following format:

ip route 0.0.0.0 0.0.0.0 [adres-następnego-skoku | interfejs-wychodzący]

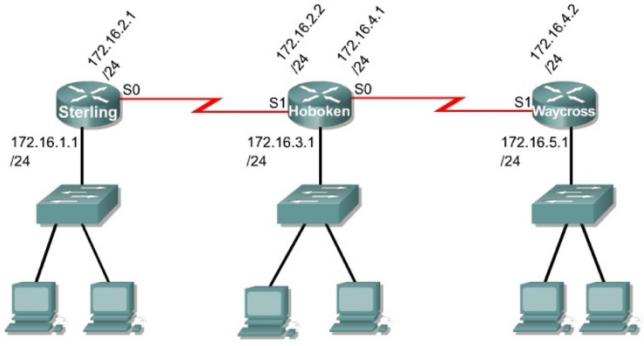
Performing a logical AND mask of 0.0.0.0 with the destination IP address of a packet to be transmitted always returns as a result the network 0.0.0.0. If the package does not fit precisely to any of routes, specified in the routing table, it is sent to the network 0.0.0.0.

In order to configure the default route, perform the following steps:

1. Enter global configuration mode.
2. Enter command ip route, using 0.0.0.0 as prefix and 0.0.0.0 as network. The parameter address indicating a default route may be the local router interface connected to external networks or IP address of the next hop router. In most cases, you must specify the IP address of next hop router.
3. Leave global configuration mode.

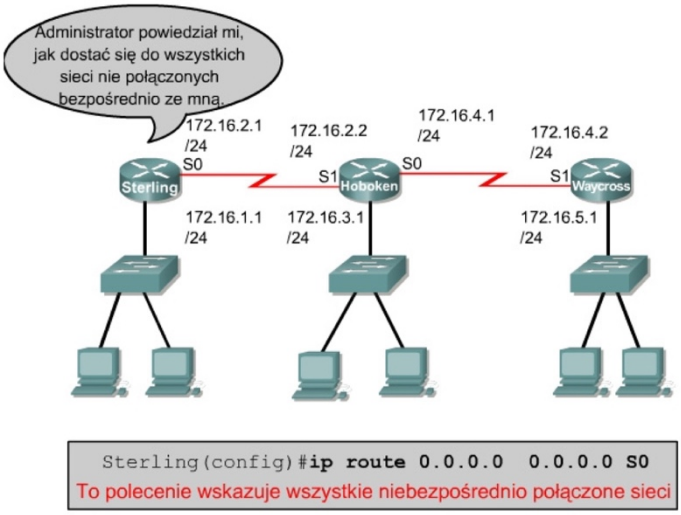
Example:

In the network as shown in the figure, you can configure additional static routes to all networks. This would not be an optimal solution and time-consuming (especially as such the task you need to perform a much larger networks).



Assume that router Hoboken has configured static routes so that it connects to networks 172.16.1.0 on Sterling and networks 172.16.5.0 on Waycross router.

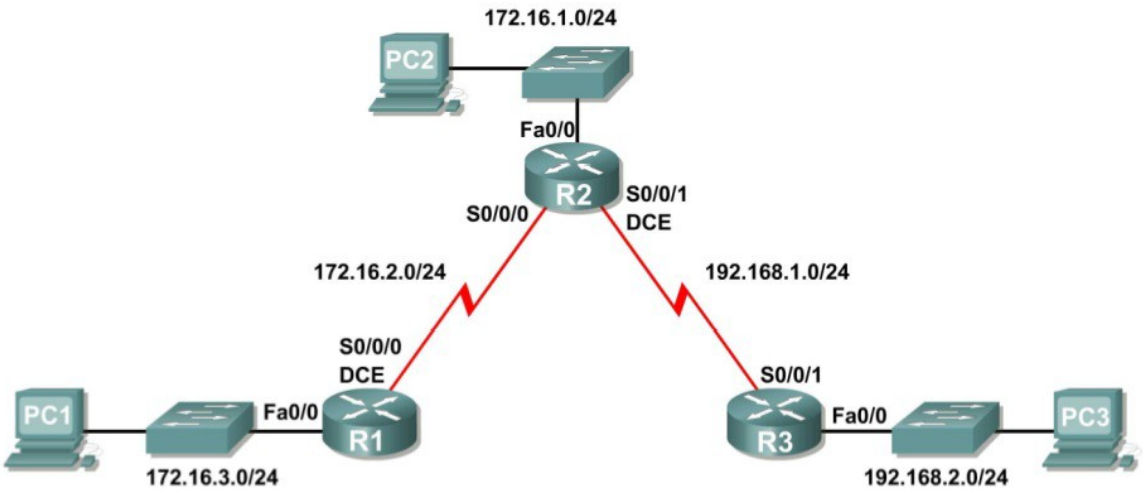
In this case, it is possible to the route packets to both of these networks from Hoboken. However, Sterling and Waycross routers do not know the way back for packets to any network that is not directly connected. For each of these destination networks, you ought to configure a static route on the router Sterling and Waycross. It would not be a scalable solution in case of a large network. Sterling Router connects to all networks that are not directly connected by a serial interface “Serial 0”. Waycross router has only one connection to all indirectly connected networks. It is implemented using a serial interface “Serial 1”. A default route on the router Sterling and Waycross can therefore be used for the routing of all packages that are designed for indirectly connected to the network. This is illustrated in the drawings below.



EXERCISE

NOTE: The report must set out all the elements (questions, commands) highlighted in red .

The aim of the exercise is to create and topology configuration similar to that shown in the figure below. (Topology analogous to that of exercise # 2)



NOTE: Interface names shown in the figure ought to be treated as examples. Please include appropriate names and types used in your routers and switches .

First create a physical network as shown in the figure above. After cleaning device(s) configuration, enter global configuration mode and make the basic configuration of the router interfaces (please refer to the exercise 2 instructions in any doubts). Parameters for configuring the interfaces are presented in table below.

Urządzenie	Interfejs	Adres IP	Maska podsieci	Brama domyślna
R1	Fa0/0	172.16.3.1	255.255.255.0	Nie dotyczy
	S0/0/0	172.16.2.1	255.255.255.0	Nie dotyczy
R2	Fa0/0	172.16.1.1	255.255.255.0	Nie dotyczy
	S0/0/0	172.16.2.2	255.255.255.0	Nie dotyczy
	S0/0/1	192.168.1.2	255.255.255.0	Nie dotyczy
R3	FA0/0	192.168.2.1	255.255.255.0	Nie dotyczy
	S0/0/1	192.168.1.1	255.255.255.0	Nie dotyczy
PC1	NIC	172.16.3.10	255.255.255.0	172.16.3.1
PC2	NIC	172.16.1.10	255.255.255.0	172.16.1.1
PC3	NIC	192.168.2.10	255.255.255.0	192.168.2.1

1. Next hop address static route configuration

a. Configure static routes from the specified output interface. On the R3 router, configure a static route to the 172.16.1.0 network. Use router R2 Serial 0/0/1 as a next hop address.

R3(config)#ip route 172.16.1.0 255.255.255.0 192.168.1.2

b. Display the contents of the routing table to verify the new entries. Note that the new route is marked with the letter S, which says that this is a static route. Provide an appropriate command and put in the report the result of its actions. **I added screenshots at the end**

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, o - ODR

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 1 subnets
S       172.16.1.0 [1/0] via 192.168.1.2
C    192.168.1.0/24 is directly connected, Serial0/0/1
C    192.168.2.0/24 is directly connected, FastEthernet0/0
R3#
```

R3# show ip route

Acording to the routing table each packet that matches the first 24 bits of the destination address to the address of 172.16.1.0/24 will be forwarded to the next hop router address 192.168.1.2. Which interface router R3 use to forward packets to the network 172.16.1.0/24? **Serial0/3/1**

c. Assume that the following packets arrived to the router R3. How the router will behave? Will it forward packets, or drop them? Using which interface router R3 send the packet?

Packet	Destination IP	Drop or send?	Interfac
1	172.16.2.1	**Drop**	
2	172.16.1.10	**Send**	**Serial0/3/1**
3	192.168.1.2	**Send**	**Serial0/3/1**
4	172.16.3.10	**Drop**	
5	192.16.2.10	**Send**	**GigabitInternet0/0**

Note: Although the R3 transmit packets to the target, this does not mean that they reach their destination.

d. Use the ping command to verify connections between hosts PC3 i PC2. Does Ping from PC3 to PC2 complete witha success? **No**

Explain your answer

PC's ping reply will drop on the R2 because doesn't have a route back to 192.168.2.0 network.

e. Configure a static route to network 192.168.2.0 on the R2 router. What is the address of the next hop router R2 to performing for a packet to the network 192.168.2.0/24?

R2(config)#ip route 192.168.2.0 255.255.255.0 **192.168.1.1**
R2(config)#

f. Display the contents of the routing table to verify the new entries. Provide appropriate command and put in the report the result of its actions. **I added screenshots at the end**

R2# `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
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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 defaul
       U - per-user static route, o - ODR

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 2 subnets
C       172.16.1.0 jest bezpośrednio podłączona, FastEthernet0/0
C       172.16.2.0 is directly connected, Serial0/0/0
C    192.168.1.0/24 is directly connected, Serial0/0/1
S    192.168.2.0/24 [1/0] via 192.168.1.1
R2#
```

g. Use the ping command to check connection between the host PC3 and PC2.

2. Configure a static route with outgoing interface

a. Set up static routes to the specified output interface. On the R3 router, configure a static route to the 172.16.2.0 network using outgoing R3 router interface Serial 0/0/1.

R3(config)# ip route 172.16.2.0 255.255.255.0 Serial0/0/1

b. Display the contents of the routing table to verify the new entries. Provide appropriate command.

R3# **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
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, o - ODR

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 3 subnets
C       172.16.1.0 is directly connected, FastEthernet0/0
C       172.16.2.0 is directly connected, Serial0/0/0
S       172.16.3.0 is directly connected, Serial0/0/0
C    192.168.1.0/24 is directly connected, Serial0/0/1
S    192.168.2.0/24 [1/0] via 192.168.1.1
R2#
```

c. Use show running-config command, to verify the currently configured static route on the R3 router.

d. How remove the static routes in this configuration,?

We can remove simply by just adding to the 'no' prefix to the command.
For Example: no ip route 172.16.2.0 255.255.255.0 Serial0/0/1

e. On the R2 router, configure a static route to the 172.16.3.0 network using outgoing interface Serial 0/0/0 router R2..

R2(config)# ip route 172.16.3.0 255.255.255.0 Serial0/0/0

f. Display the contents of the routing table to verify the new entries. Provide an appropriate command.

R2# **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
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, o - ODR

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 3 subnets
C       172.16.1.0 is directly connected, FastEthernet0/0
C       172.16.2.0 is directly connected, Serial0/0/0
S       172.16.3.0 is directly connected, Serial0/0/0
C    192.168.1.0/24 is directly connected, Serial0/0/1
S    192.168.2.0/24 [1/0] via 192.168.1.1
R2#
```

Now R2 has a complete routing table with valid routes to all five networks shown in the topology diagram. Does this mean that R2 can receive ping replies from all of the devices in the topology diagram? _

Explain your answer.

No because R2 can route all of the networks but its not for sure the other routers able to route back to R2.

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g. Use the ping command to check connectivity between the host PC2 and PC1. This test should end in failure, because the router R1 does not have a routing table back route to network 172.16.1.0. How to solve this problem ?

We can solve this by adding a new route to the R1. Desired route can be added with

---

using this command: 'ip route 172.16.1.0 255.255.255.0 192.161.2.2'.

(192.161.2.2 is R2's Serial0/0 ip address)

3. Default static route configuration

In the previous steps specified routes were configured. It is recommended to add a default static route in order to minimize the size of the routing table and allow traffic to all other address fields.

While there is no better and more detailed route to the destination - router uses such a route. Instead of configuring additional static routes on R1, we can assume that R1 is the ***stub router***. This means that R2 is the default gateway for the router R1.

If the router R1 has packets destined for networks that are not directly connected with it, it should sent them to the router R2.

However, it is necessary need to configure the default route on the R1 router, before the device sends packets destined for an unknown destination to R2. Otherwise, the router R1 will drop these packets.

a. Configure a default route on router R1, using the Serial 0/0/0 interface (on R1) as the

next hop address:

R1(config)#ip route 0.0.0.0 0.0.0.0 172.16.2.2

b. Display the contents of the routing table to verify the new entries. Provide appropriate command and put the result of his actions in the report. **I added screenshots at the end.**

R1# **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
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, o - ODR

Gateway of last resort is 172.16.2.2 to network 0.0.0.0

     172.16.0.0/24 is subnetted, 2 subnets
C       172.16.2.0 is directly connected, Serial0/0/0
C       172.16.3.0 is directly connected, FastEthernet0/0
S* 0.0.0.0/0 [1/0] via 172.16.2.2
R1#
```

Note that the router R1 now has a default route, the so-called ***gateway of last resort***, and then will send the unknown traffic to Serial 0/0/0 intreface on R2 router.

c. Use the ping command to check connectivity between the hosts PC2 and PC1. Was ping from PC2 to PC1 successful? **yes** Was ping from PC3 to PC1 successful? **no** Is there a route to network 172.16.3.0 in R3 routing table? **no**

4. Cumulative static route configuration

The static route to the 172.16.3.0 network can be configure on the R3 router. However, there are already two static routes to networks 172.16.2.0/24 and 172.16.1.0/24. These routes can be combined into one. This will reduce the size of the routing table and make the route search process more efficient.

The first 22 bits of presented in binary form three network addresses are identical. If we reset the remaining 10 bits we obtain the address 172.16.0.0, which is the network prefix.

```
172.16.1.0      10101100.00010000.00000001.00000000
172.16.2.0      10101100.00010000.00000010.00000000
172.16.3.0      10101100.00010000.00000011.00000000
```

prefix 172.16.0.0
The mask 22 consists of binary ones and 10 zeros. mask
11111111.11111111.11111100.00000000
Mask in decimal form: 255.255.252.0

a. Configure the cumolative static route on the router R3.

Use network 172.16.0.0/22 in the process of configuring route cumulative.

R3(config)#ip route 172.16.0.0 255.255.252.0 192.168.1.2

b. Verify cumulative route in the routing table. Provide appropriate command and put in the report the result of its actions. **I added screenshots at the end**

R3# **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
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, ia - IS-IS inter are
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
S       172.16.0.0/22 [1/0] via 192.168.1.2
S       172.16.1.0/24 [1/0] via 192.168.1.2
S       172.16.2.0/24 is directly connected, Serial0/0/1
C    192.168.1.0/24 is directly connected, Serial0/0/1
C    192.168.2.0/24 is directly connected, FastEthernet0/0
```

Configuration of cumulative route on the router R3 should not result in the removal of static routes configured earlier because these routes are more specific. Both use a mask / 24, while summing up the route uses a mask / 22. To reduce the size of the routing table, you can remove the more specific route with a mask / 24.

c. Removing a static route from R3

Remove the two static routes that are currently configured on the router R3. Use formulas do before the appropriate command as in the example below.

R3(config)#no ip route 172.16.1.0 255.255.255.0 192.168.1.2
R3(config)#no ip route 172.16.2.0 255.255.255.0 Serial0/0/1

d. Make sure that the routes are still in the routing table. Provide appropriate

action to add to the report the result of its actions. **I added screenshots at the end**

R3# **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
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/22 is subnetted, 1 subnets
S       172.16.0.0 [1/0] via 192.168.1.2
C    192.168.1.0/24 is directly connected, Serial0/0/1
C    192.168.2.0/24 is directly connected, FastEthernet0/0
```

R3 is now only one route to the network 172.16.0.0/24, 172.16.1.0/24, 172.16.2.0/24 and 172.16.3.0/24. Traffic destined for these networks will be sent to the address 192.168.1.2 router R2.

a. Use the ping command to verify connectivity between hosts: PC3 and PC1.Was ping from PC1 to PC3 successful? **yes**

5. TASKS FOR SELF-STUDY **I answered these questions on the last page**

5.1 Explain what does an administrative distance mean? What are the default values in case of configuring static routing and how the command can be given its own value.

5.2Is the administrative distance can be used in the process of setting up spare routes? If yes, please explain the principle of conduct.

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REPORTS FILE NAME ACCORDING TO THE SCHEME:
Spr3_<name of student>.pdf

PREFFERED FILE FORMAT: PDF

1) b)

```
R3#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 1 subnets
S       172.16.1.0/24 [1/0] via 192.168.1.2
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, Serial0/3/1
L       192.168.1.1/32 is directly connected, Serial0/3/1
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, GigabitEthernet0/0
L       192.168.2.1/32 is directly connected, GigabitEthernet0/0
```

1) f)

```
R2#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.0.0/16 is directly connected, GigabitEthernet0/0
L       172.16.1.1/32 is directly connected, GigabitEthernet0/0
     192.161.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.161.2.0/24 is directly connected, Serial0/3/0
L       192.161.2.2/32 is directly connected, Serial0/3/0
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, Serial0/3/1
L       192.168.1.2/32 is directly connected, Serial0/3/1
S    192.168.2.0/24 [1/0] via 192.168.1.1
```

3) b)

```
R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 192.161.2.2 to network 0.0.0.0

     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.0.0/16 is directly connected, GigabitEthernet0/0
L       172.16.3.1/32 is directly connected, GigabitEthernet0/0
     192.161.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.161.2.0/24 is directly connected, Serial0/3/0
L       192.161.2.1/32 is directly connected, Serial0/3/0
S*   0.0.0.0/0 [1/0] via 192.161.2.2
```

4) b)

```
R3#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/16 is variably subnetted, 3 subnets, 2 masks
S       172.16.0.0/22 [1/0] via 192.168.1.2
S       172.16.1.0/24 [1/0] via 192.168.1.2
S       172.16.2.0/24 is directly connected, Serial0/3/1
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, Serial0/3/1
L       192.168.1.1/32 is directly connected, Serial0/3/1
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, GigabitEthernet0/0
L       192.168.2.1/32 is directly connected, GigabitEthernet0/0
```

4) d)

```
R3#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       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, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/22 is subnetted, 1 subnets
S       172.16.0.0/22 [1/0] via 192.168.1.2
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, Serial0/3/1
L       192.168.1.1/32 is directly connected, Serial0/3/1
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, GigabitEthernet0/0
L       192.168.2.1/32 is directly connected, GigabitEthernet0/0
```

5.1) Its basically trust worthiness of the information received by the router.It can be between 0-255. Less value is more trusted.
Provides a best path chosen by router when there are two or more routes to the same destination from two different routing protocols.

Default values are: Directly Connected = 0
Static Route = 1
IGRP = 100
EIGRP = 90
OSPF = 110
RIP = 120

5.2) 9.2) I think it can be used.I dont know what is the Best Practices for doing this but i would try to explain myself with some made up scenario.

For example there are 2 router which is connected each others with 'IGRP', 'EIGRP' and 'OSPF' protocols. 'EIGRP' is the best between them and probably used one by the router. And some day if there is a problem with our used 'EIGRP' route, we can still able the use network with using other protocols('IGRP' will be in our case). So we had loss some trustworthiness but its better than the losing all connection.

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