

« به نام خدا »

فعال سازی اینترفیس های loopback :

```
Router3
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#interface loopback 1

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1,
changed state to up

Router(config-if)#ip add
Router(config-if)#ip address 10.1.1.1 255.255.255.0
Router(config-if)#ex
Router(config)#

Router2
Router(config-if)#ip address 10.1.200.2 255.255.255.0
Router(config-if)#no sh

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/2/0, changed state to up

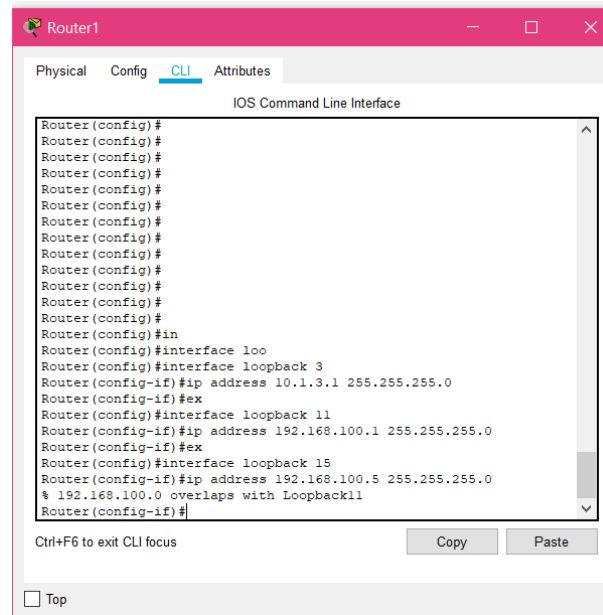
Router(config-if)#ex
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/2/0,
changed state to up

Router(config)#in
Router(config)#interface loo
Router(config)#interface loopback 2

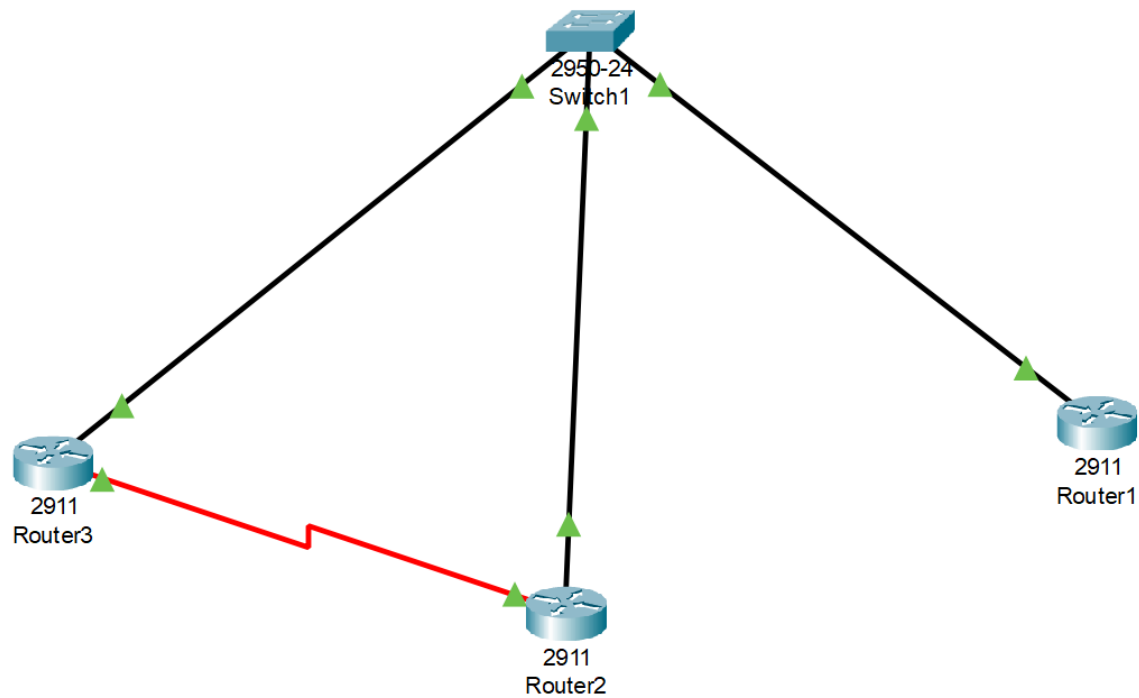
Router(config-if)#
%LINK-5-CHANGED: Interface Loopback2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback2,
changed state to up

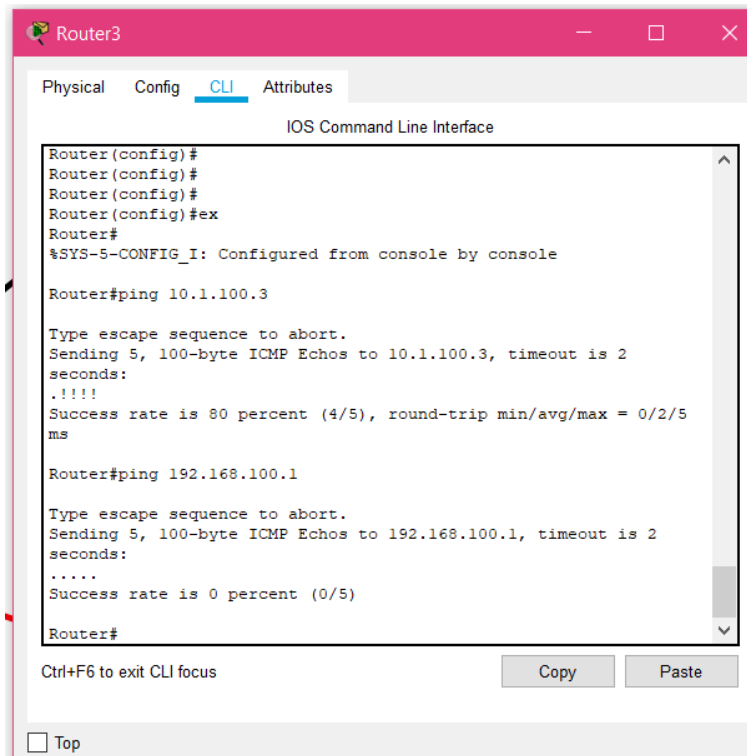
Router(config-if)#ip add
Router(config-if)#ip address 10.1.2.1 255.255.255.0
Router(config-if)#ex
Router(config)#
```



سناریو ایجاد شده (ضمیمه شده):

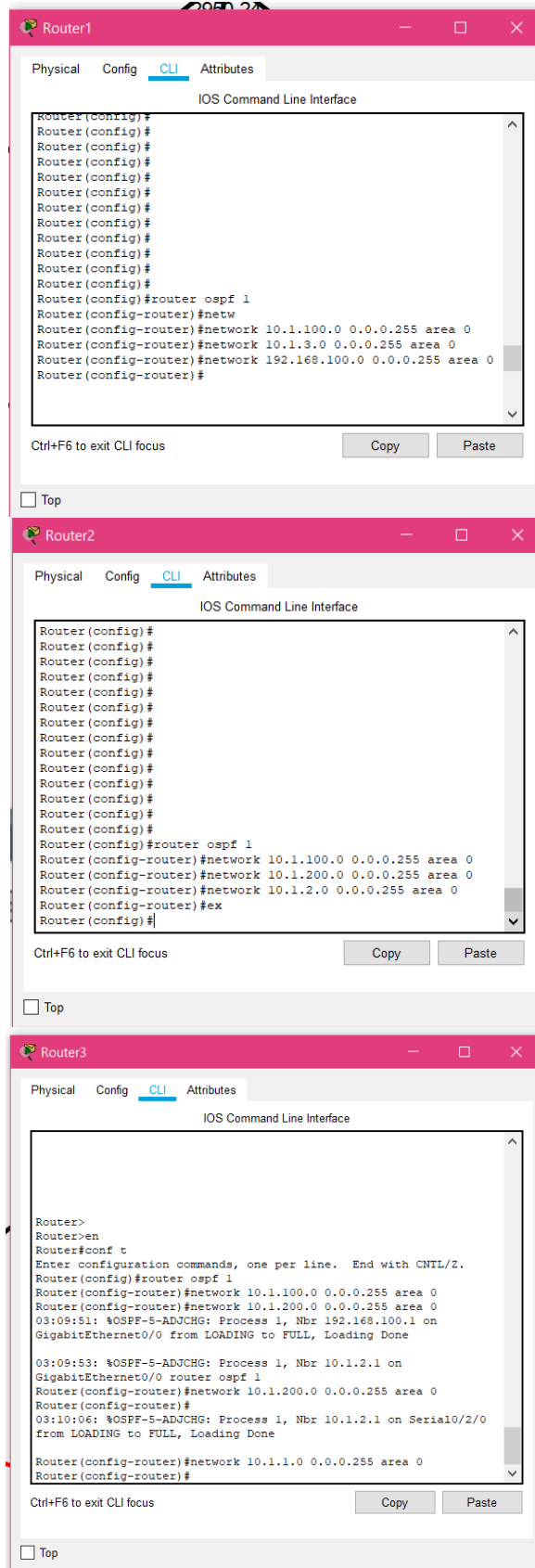


همانطور که بدیهی است، بدون استفاده از هیچگونه پروتکل routing ای، از یک router به بقیه ی router ها ping داریم؛ چون در یک رنج یکسان از IP قرار دارند. ولی به loopback های router های دیگر ping نداریم؛ چرا که در رنج های متفاوتی از IP قرار دارند. در شکل زیر یک نمونه از هر کدام امتحان شده:

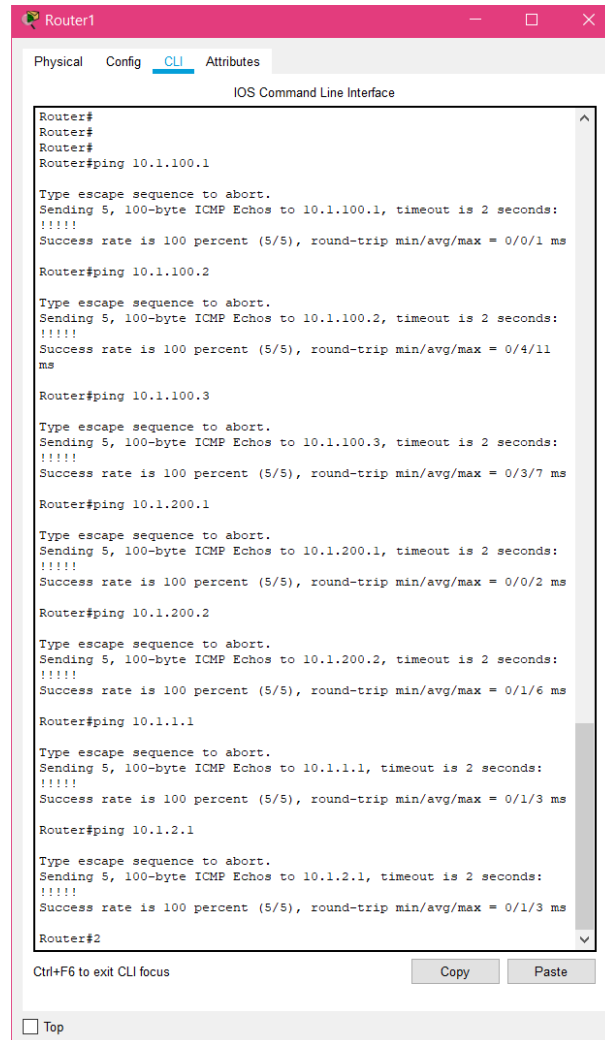


```
Router3
Physical Config CLI Attributes
IOS Command Line Interface
Router(config)#
Router(config)#
Router(config)#
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#ping 10.1.100.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.3, timeout is 2
seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/2/5
ms
Router#ping 192.168.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.1, timeout is 2
seconds:
.....
Success rate is 0 percent (0/5)
Router#
Ctrl+F6 to exit CLI focus
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```

پس حالا سعی می کنیم با استفاده از OSPF این امکان ping به همه ی interface ها مهیا بشود. پس OSPF را روی router ها اجرا میکنیم و شبکه های متصل به آنها را تبلیغ میکنیم:



پس به این ترتیب OSPF برای همه ی router های این شبکه config شد.
و از همه ی router ها به همه ی interface ها و همه جای شبکه ping داریم:



```
Router1
Router#
Router#
Router#ping 10.1.100.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.1, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Router#ping 10.1.100.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.2, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/4/11 ms

Router#ping 10.1.100.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.3, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/3/7 ms

Router#ping 10.1.200.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.200.1, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/2 ms

Router#ping 10.1.200.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.200.2, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/6 ms

Router#ping 10.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/3 ms

Router#ping 10.1.2.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.2.1, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/3 ms

Router#2
```

Ctrl+F6 to exit CLI focus

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Router2

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Router#ping 10.1.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/6 ms

Router#ping 10.1.100.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/7 ms

Router#ping 10.1.100.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/8 ms

Router#ping 10.1.200.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.200.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/13 ms

Router#ping 10.1.200.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.200.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/5/18 ms

Router#ping 10.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms

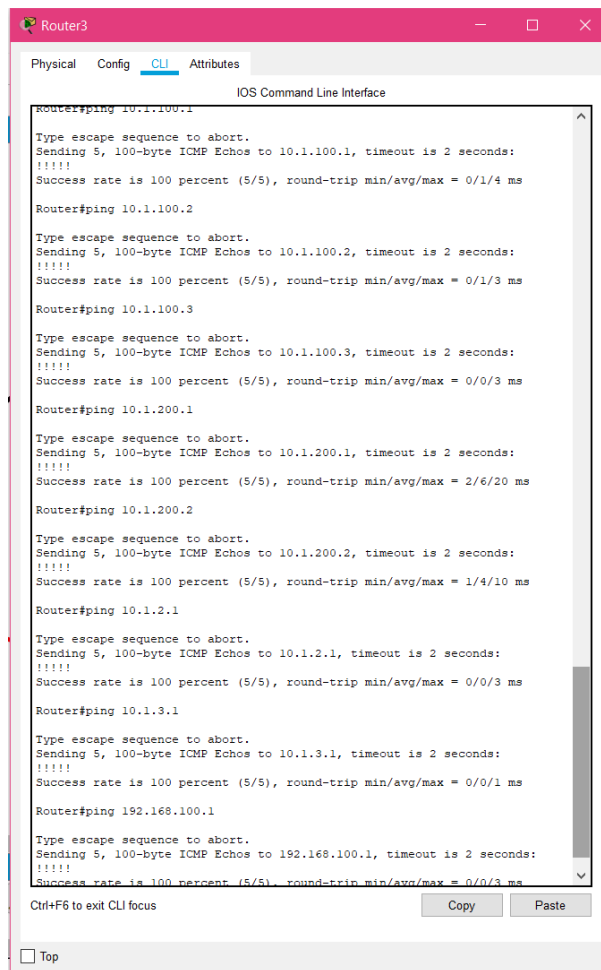
Router#ping 192.168.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Router#ping 10.1.3.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.3.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/3/14 ms
```

Ctrl+F6 to exit CLI focus

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```
Router3
Physical Config CLI Attributes
IOS Command Line Interface
Router#ping 10.1.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/4 ms

Router#ping 10.1.100.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/3 ms

Router#ping 10.1.100.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.100.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms

Router#ping 10.1.200.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.200.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/6/20 ms

Router#ping 10.1.200.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.200.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/10 ms

Router#ping 10.1.2.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.2.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms

Router#ping 10.1.3.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.3.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

Router#ping 192.168.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms

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```

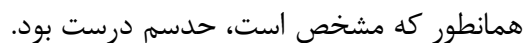
به این ترتیب از همه ی router ها به همه ی شبکه های سناریو ping داشتیم.

Router1 دارای دو loopback با IP های 10.1.3.1 و 192.168.100.1 است. بنابراین با انتخاب IP بزرگتر، 192.168.100.1 به عنوان ID برای آن در نظر گرفته می شود.

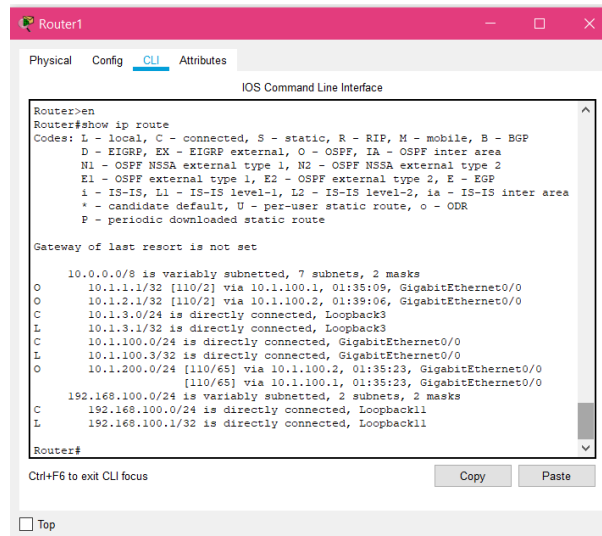
Router2 دارای یک loopback با IP 10.1.2.1 است، که به عنوان ID برای آن در نظر گرفته می شود.

Router3 دارای یک loopback با IP 10.1.3.1 است، که به عنوان ID برای آن در نظر گرفته می شود.

این حدس را چک میکنم:



جداول مسیر یابی را بررسی میکنیم:



```
Router1
Physical Config CLI Attributes
IOS Command Line Interface
Router>en
Router#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

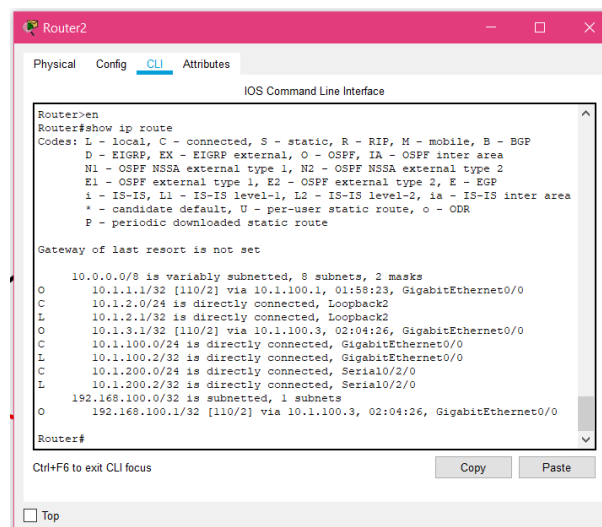
Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
O   10.1.1.1/32 [110/2] via 10.1.100.1, 01:35:09, GigabitEthernet0/0
O   10.1.2.1/32 [110/2] via 10.1.100.2, 01:39:06, GigabitEthernet0/0
C   10.1.3.0/24 is directly connected, Loopback3
L   10.1.3.1/32 is directly connected, Loopback3
C   10.1.100.0/24 is directly connected, GigabitEthernet0/0
L   10.1.100.3/32 is directly connected, GigabitEthernet0/0
O   10.1.200.0/24 [110/65] via 10.1.100.2, 01:35:23, GigabitEthernet0/0
    [110/65] via 10.1.100.1, 01:35:23, GigabitEthernet0/0
C   192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C   192.168.100.0/24 is directly connected, Loopback11
L   192.168.100.1/32 is directly connected, Loopback11

Router#
```

همانطور که مشخص است، به دو اینترفیس loopback 3 و 11 و یک لینک اترنت به صورت مستقیم دسترسی دارد؛ که در سطرهای شروع شوند با C هستند. و در سطرهای شروع شوند با O هم شبکه ها و لینک هایی هستند که به وسیله ی OSPF متصل شده اند. و cost هر لینک هم در هر سطر مشخص است.

در بقیه ی router ها هم به همین ترتیب شبکه هایی که به روش های مستقیم و غیرمستقیم متصل هستند را میبینیم:

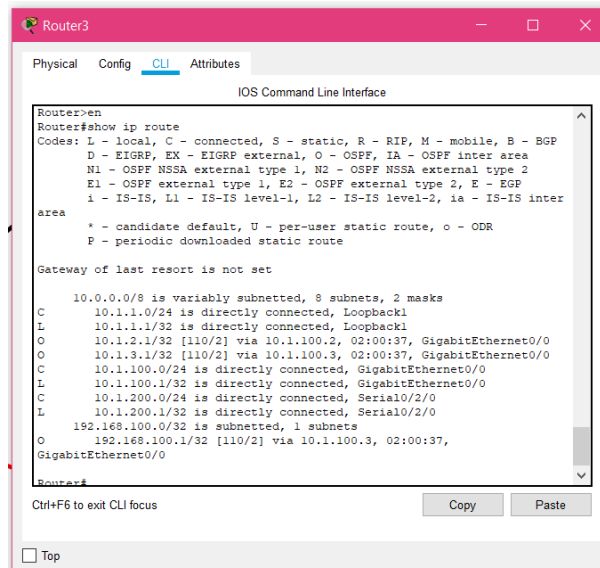


```
Router2
Physical Config CLI Attributes
IOS Command Line Interface
Router>en
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
        D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
        N1 - OSPF NSSA external type 1, N2 - OSPF NSSA 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

10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
O   10.1.1.1/32 [110/2] via 10.1.100.1, 01:58:23, GigabitEthernet0/0
C   10.1.2.0/24 is directly connected, Loopback2
L   10.1.2.1/32 is directly connected, Loopback2
O   10.1.3.1/32 [110/2] via 10.1.100.3, 02:04:26, GigabitEthernet0/0
C   10.1.100.0/24 is directly connected, GigabitEthernet0/0
L   10.1.100.2/32 is directly connected, GigabitEthernet0/0
C   10.1.200.0/24 is directly connected, Serial0/2/0
L   10.1.200.2/32 is directly connected, Serial0/2/0
O   192.168.100.0/32 is subnetted, 1 subnets
    O   192.168.100.1/32 [110/2] via 10.1.100.3, 02:04:26, GigabitEthernet0/0

Router#
```



```
Router3
Physical Config CLI Attributes
IOS Command Line Interface
Router>en
Router#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

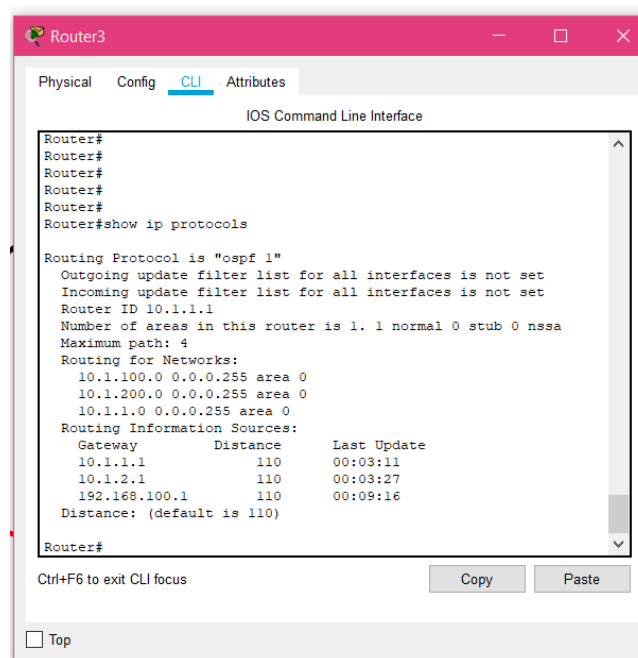
    10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
    C    10.1.1.0/24 is directly connected, Loopback1
    L    10.1.1.1/32 is directly connected, Loopback1
    O    10.1.2.1/32 [110/2] via 10.1.100.2, 02:00:37, GigabitEthernet0/0
    O    10.1.3.1/32 [110/2] via 10.1.100.3, 02:00:37, GigabitEthernet0/0
    C    10.1.100.0/24 is directly connected, GigabitEthernet0/0
    L    10.1.100.1/32 is directly connected, GigabitEthernet0/0
    C    10.1.200.0/24 is directly connected, Serial0/2/0
    L    10.1.200.1/32 is directly connected, Serial0/2/0
    O    192.168.100.0/32 is subnetted, 1 subnets
    O    192.168.100.1/32 [110/2] via 10.1.100.3, 02:00:37,
    GigabitEthernet0/0
Router#
```

Ctrl+F6 to exit CLI focus

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دستورات گفته شده در دستور کار:



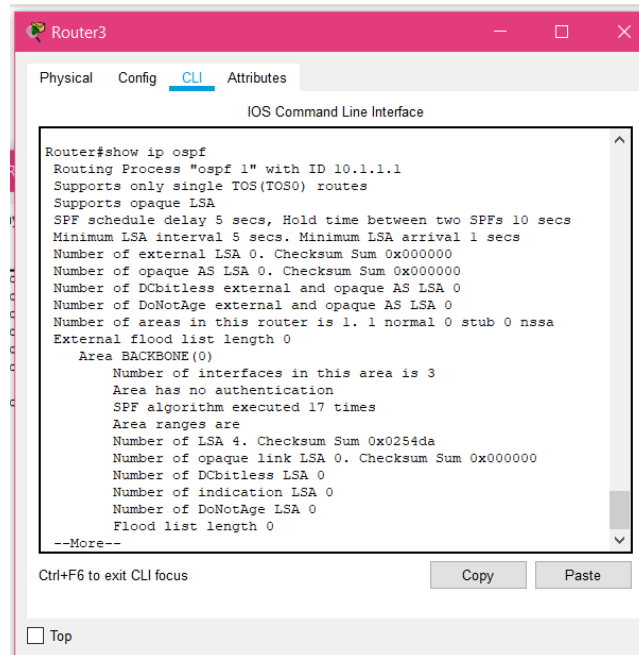
```
Router3
Physical Config CLI Attributes
IOS Command Line Interface
Router#
Router#
Router#
Router#
Router#show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 10.1.1.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.1.100.0 0.0.0.255 area 0
    10.1.200.0 0.0.0.255 area 0
    10.1.1.0 0.0.0.255 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.1.1.1         110          00:03:11
    10.1.2.1         110          00:03:27
    192.168.100.1    110          00:09:16
  Distance: (default is 110)
Router#
```

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Router3

Physical Config CLI Attributes

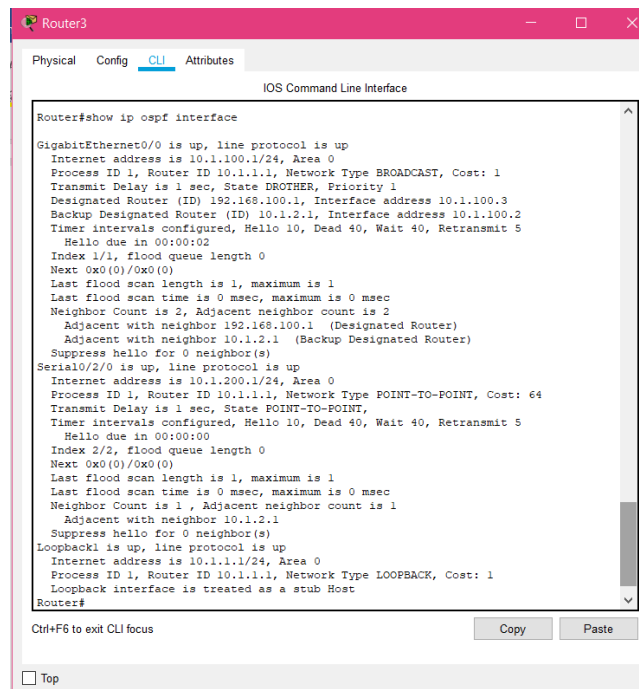
IOS Command Line Interface

```
Router#show ip ospf
Routing Process "ospf 1" with ID 10.1.1.1
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
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)
  Number of interfaces in this area is 3
  Area has no authentication
  SPF algorithm executed 17 times
  Area ranges are
    Number of LSA 4. Checksum Sum 0x0254da
    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
--More--
```

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Router3

Physical Config CLI Attributes

IOS Command Line Interface

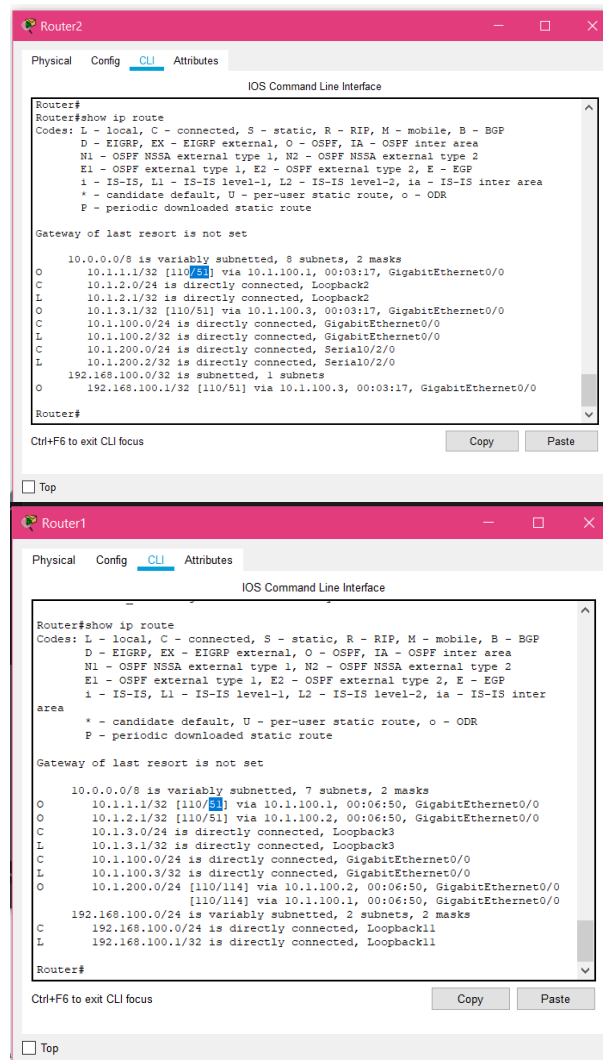
```
Router#show ip ospf interface
GigabitEthernet0/0 is up, line protocol is up
Internet address is 10.1.100.1/24, Area 0
Process ID 1, Router ID 10.1.1.1, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DROTHER, Priority 1
Designated Router (ID) 192.168.100.1, Interface address 10.1.100.3
Backup Designated Router (ID) 10.1.2.1, Interface address 10.1.100.2
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:02
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 192.168.100.1 (Designated Router)
    Adjacent with neighbor 10.1.2.1 (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
Serial0/2/0 is up, line protocol is up
Internet address is 10.1.200.1/24, Area 0
Process ID 1, Router ID 10.1.1.1, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:00
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 10.1.2.1
  Suppress hello for 0 neighbor(s)
Loopback1 is up, line protocol is up
Internet address is 10.1.1.1/24, Area 0
Process ID 1, Router ID 10.1.1.1, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
Router#
```

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میخواهم cost را برای 0/0 fast برابر با 50 قرار بدهم:



همانطور که مشخص است، COST اینترفیس های مورد نظر به درستی عوض شده است.

نمونه چک کردن تنظیمات انجام شده روی router ها با استفاده از دستور

show running-config

 Router3

Physical Config CLI Attributes

```
!
interface Loopback0
no ip address
!
interface Loopback1
ip address 10.1.1.1 255.255.255.0
!
interface GigabitEthernet0/0
bandwidth 2000
ip address 10.1.100.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/2/0
ip address 10.1.200.1 255.255.255.0
clock rate 56000
!
interface Serial0/2/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
log-adjacency-changes
network 10.1.100.0 0.0.0.255 area 0
network 10.1.200.0 0.0.0.255 area 0
network 10.1.1.0 0.0.0.255 area 0
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
!
```

Ctrl+F6 to exit CLI focus

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