INSTITUTO POLITÉCNICO DE TOMAR

ESCOLA SUPERIOR DE TECNOLOGIA DE TOMAR

ENGENHARIA INFORMÁTICA

REDES DE DADOS II

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Lab 4 – BGP multihomed

Rodrigo Bento 21890
Aluno21890@ipt.pt

Ruben Muchaxo 21891
Aluno21891@ipt.pt

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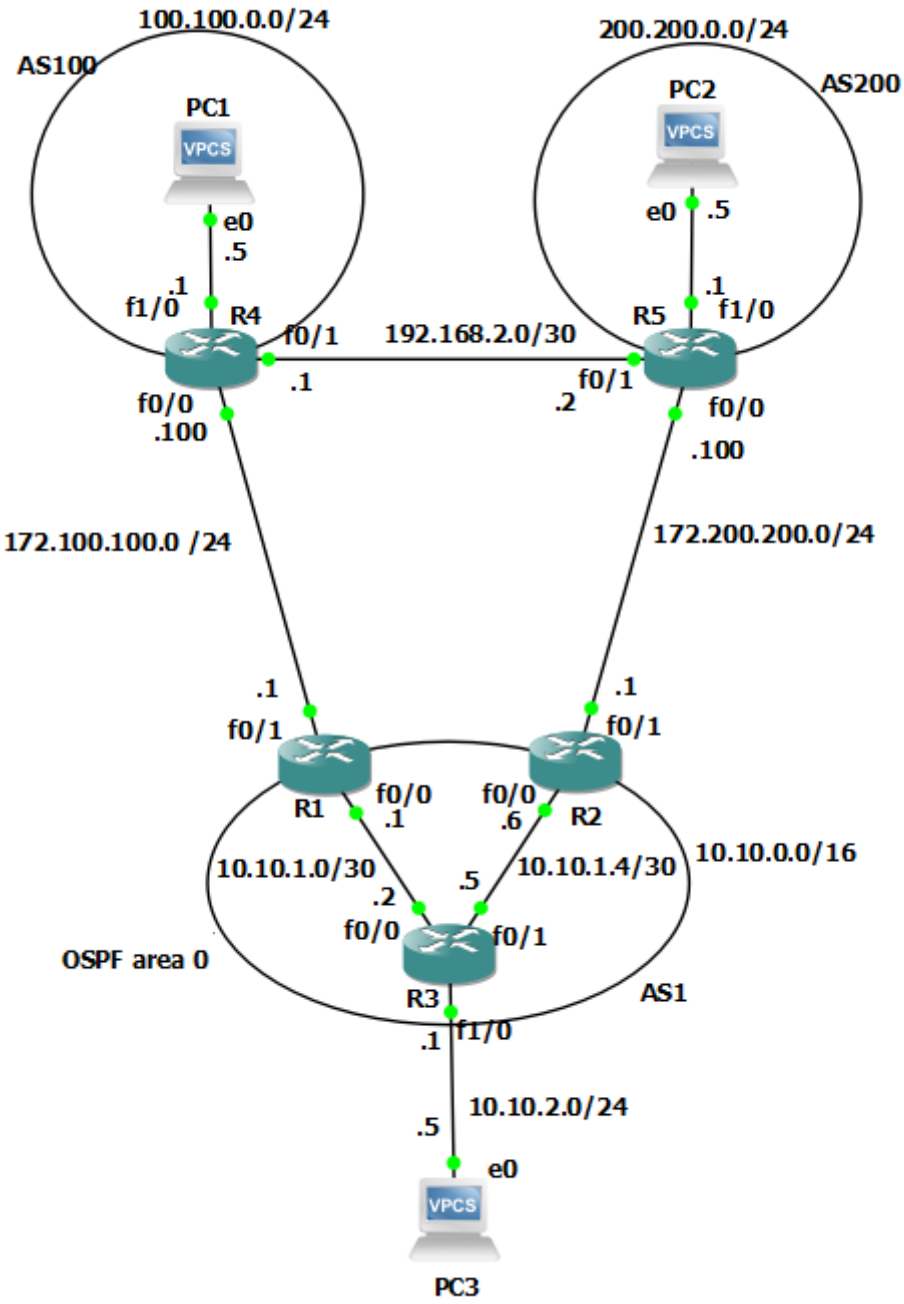
Tarefa 1: Montar a rede

Passo 1: Apague as configurações dos routers.

Passo 2: Ligue os cabos aos equipamentos ativos de acordo com topologia definida na figura anterior.



Tarefa 2: Configurações básicas

1. **Atribua um nome a cada router de acordo com a topologia descrita (hostname)**
   R1(config)#hostname R1

2. **Desabilite o DNS lookup.**
   R1(config)#no ip domain-lookup

3. **Configure uma password para aceder ao modo Exec Privileged Mode. (Password=class)**
   R1(config)#enable password class

4. **Configure a message-of-the-day banner.**
   R1(config)#banner motd "Unauthorized access is prohibited"

5. **Configure uma password para ligações do tipo console. (Password=class)**

   R1(config)#line console 0

   R1(config-line)#password class

   R1(config-line)#exit

6. **Configure uma password para ligações do tipo VTY. (Password=class)**
   R1(config)#line vty 0 4
   R1(config-line)#password class
   R1(config-line)#exit

Tarefa 3: Configure as interfaces dos Routers

Passo 1: Defina o esquema de endereçamento para o AS que lhe foi atribuído. Deve minimizar o desperdício de endereços.

Passo 2: Configure as interfaces dos routers de acordo com a topologia e com o plano de endereçamento definido.

Interfaces Loopback:

R1:

```
R1(config)#interface loopback 0
R1(config-if)#
*Mar  1 00:22:15.863: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopba
ck0, changed state to up
R1(config-if)#ip add 1.1.1.1 255.255.255.0
R1(config-if)#exit
```

R2:

```
R2(config)#int loopback 0
R2(config-if)#ip add
*Mar  1 00:34:29.471: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
 changed state to up
R2(config-if)#ip add 2.2.2.2 255.255.255.0
R2(config-if)#exit
```

R3:

```
R3(config)#int loopback 0
R3(config-if)#
*Mar  1 00:28:06.871: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
 changed state to up
R3(config-if)#ip add 3.3.3.3 255.255.255.0
R3(config-if)#exit
```

R4:

```
R4(config)#int loopback 0
R4(config-if)#ip add
*Mar  1 00:28:33.983: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
 changed state to up
R4(config-if)#ip add 4.4.4.4 255.255.255.0
R4(config-if)#exit
```

R5:

```
R5(config)#int loopback 0
R5(config-if)#ip add
*Mar  1 00:29:17.219: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
 changed state to up
R5(config-if)#ip add 5.5.5.5 255.255.255.0
R5(config-if)#exit
```

Passo 3: Verifique o estado das interfaces e os endereços que lhes estão atribuídos.

```
Router1#Show ip int br
Interface                  IP-Address      OK? Method Status                Prot
ocol
FastEthernet0/0            10.10.1.1       YES NVRAM  up                    up

FastEthernet0/1            172.100.100.10  YES NVRAM  up                    up

FastEthernet1/0            unassigned      YES NVRAM  administratively down down

Loopback0                  1.1.1.1         YES manual up                    up

Loopback1                  unassigned      YES unset  up                    up

Router1#
```

```
R2#show ip int br
Interface                  IP-Address      OK? Method Status                Prot
ocol
FastEthernet0/0            10.10.1.6       YES NVRAM  up                    up

FastEthernet0/1            172.200.200.10  YES NVRAM  up                    up

FastEthernet1/0            unassigned      YES NVRAM  administratively down down

Loopback0                  2.2.2.2         YES manual up                    up

R2#
```

```
R3#show ip int br
Interface                  IP-Address      OK? Method Status                Prot
ocol
FastEthernet0/0            10.10.1.2       YES NVRAM  up                    up

FastEthernet0/1            10.10.1.5       YES NVRAM  up                    up

FastEthernet1/0            10.10.2.1       YES NVRAM  up                    up

Loopback0                  3.3.3.3         YES manual up                    up

R3#
```

```
R4#sh ip int br
Interface                  IP-Address      OK? Method Status                Prot
ocol
FastEthernet0/0            172.100.100.100 YES manual up                    up

FastEthernet0/1            192.168.2.1     YES manual up                    up

FastEthernet1/0            100.100.0.1     YES manual up                    up

Loopback0                  4.4.4.4         YES manual up                    up
```

```
R5#sh ip int bri
Interface                  IP-Address      OK? Method Status                Prot
ocol
FastEthernet0/0            172.200.200.100 YES manual up                    up

FastEthernet0/1            192.168.2.2     YES manual up                    up

FastEthernet1/0            200.200.0.1     YES manual up                    up

Loopback0                  5.5.5.5         YES manual up                    up
```

Tarefa 4: Configure o encaminhamento IGP

Passo 1: Use o protocolo OSPF como IGP no seu sistema autónomo. Todas as interfaces devem pertencer à área 0.

R1:

```
R1(config)#router ospf 1
R1(config-router)#network 10.10.1.0 0.0.0.3 area 0
R1(config-router)#network 1.1.1.0 0.0.0.255 area 0
```

R2:

```
R2(config)#router ospf 1
R2(config-router)#network 10.10.1.4 0.0.0.3 area 0
R2(config-router)#network 2.2.2.0 0.0.0.255 area 0
```

R3:

```
R3(config)#router ospf 1
R3(config-router)#network 10.10.1.0 0.0.0.3 area 0
R3(config-router)#network 10.10.1.4 0.0.0.3 area 0
R3(config-router)#network 3.3.3.0 0.0.0.255 area 0
```

Passo 2: Consulte e registe a tabela de encaminhamento de cada um dos routers. Verifique que tem conectividade para todas as redes do seu AS.

```
R1#ping 10.10.1.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/39/44 ms
R1#ping 10.10.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/20/24 ms
```

```
R2#ping 10.10.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/37/44 ms
R2#ping 10.10.1.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/21/24 ms
```

```
R3#ping 10.10.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/21/24 ms
R3#ping 10.10.1.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/20/24 ms
```

Registe e interprete o resultado dos comandos seguintes:

- show ip route

```
Router1#show ip route
Codes: 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
       i - IS-IS, su - IS-IS summary, 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

     1.0.0.0/24 is subnetted, 1 subnets
C       1.1.1.0 is directly connected, Loopback0
     172.100.0.0/24 is subnetted, 1 subnets
C       172.100.100.0 is directly connected, FastEthernet0/1
     10.0.0.0/30 is subnetted, 2 subnets
C       10.10.1.0 is directly connected, FastEthernet0/0
O       10.10.1.4 [110/20] via 10.10.1.2, 00:05:15, FastEthernet0/0
Router1#
```

```
R2#show ip route
Codes: 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
       i - IS-IS, su - IS-IS summary, 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

     2.0.0.0/24 is subnetted, 1 subnets
C       2.2.2.0 is directly connected, Loopback0
     172.200.0.0/24 is subnetted, 1 subnets
C       172.200.200.0 is directly connected, FastEthernet0/1
     10.0.0.0/30 is subnetted, 2 subnets
O       10.10.1.0 [110/20] via 10.10.1.5, 00:05:59, FastEthernet0/0
C       10.10.1.4 is directly connected, FastEthernet0/0
R2#
```

```
R3#show ip route
Codes: 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
       i - IS-IS, su - IS-IS summary, 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

     3.0.0.0/24 is subnetted, 1 subnets
C       3.3.3.0 is directly connected, Loopback0
     10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C       10.10.1.0/30 is directly connected, FastEthernet0/0
C       10.10.2.0/24 is directly connected, FastEthernet1/0
C       10.10.1.4/30 is directly connected, FastEthernet0/1
R3#
```

- show ip ospf

```
R1#sh ip ospf
 Routing Process "ospf 1" with ID 1.1.1.1
 Start time: 00:57:55.408, Time elapsed: 00:09:43.320
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Supports area transit capability
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 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
 Number of areas transit capable is 0
 External flood list length 0
    Area BACKBONE(0)
        Number of interfaces in this area is 1
        Area has no authentication
        SPF algorithm last executed 00:05:38.340 ago
        SPF algorithm executed 3 times
        Area ranges are
        Number of LSA 5. Checksum Sum 0x021B68
        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
```

```
R2#sh ip ospf
 Routing Process "ospf 1" with ID 2.2.2.2
 Start time: 00:59:16.460, Time elapsed: 00:09:02.688
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Supports area transit capability
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 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
 Number of areas transit capable is 0
 External flood list length 0
    Area BACKBONE(0)
        Number of interfaces in this area is 1
        Area has no authentication
        SPF algorithm last executed 00:06:43.796 ago
        SPF algorithm executed 2 times
        Area ranges are
        Number of LSA 5. Checksum Sum 0x021B68
        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
```

```
R3#show ip ospf
 Routing Process "ospf 1" with ID 3.3.3.3
 Start time: 00:26:58.516, Time elapsed: 00:07:59.608
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Supports area transit capability
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 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
 Number of areas transit capable is 0
 External flood list length 0
    Area BACKBONE(0)
        Number of interfaces in this area is 2
        Area has no authentication
        SPF algorithm last executed 00:07:34.116 ago
        SPF algorithm executed 2 times
        Area ranges are
        Number of LSA 5. Checksum Sum 0x021D67
        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

R3#
```

- show ip ospf interface

```
Router1#show ip ospf int
FastEthernet0/0 is up, line protocol is up
  Internet Address 10.10.1.1/30, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 10.10.1.1
  Backup Designated router (ID) 3.3.3.3, Interface address 10.10.1.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:00
  Supports Link-local Signaling (LLS)
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, 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 3.3.3.3  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
Router1#
```

```
R2#sh ip ospf int
FastEthernet0/0 is up, line protocol is up
  Internet Address 10.10.1.6/30, Area 0
  Process ID 1, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 2.2.2.2, Interface address 10.10.1.6
  Backup Designated router (ID) 3.3.3.3, Interface address 10.10.1.5
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:04
  Supports Link-local Signaling (LLS)
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 0, 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 3.3.3.3  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
```

```
R3#sh ip ospf int
FastEthernet0/1 is up, line protocol is up
  Internet Address 10.10.1.5/30, Area 0
  Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 2.2.2.2, Interface address 10.10.1.6
  Backup Designated router (ID) 3.3.3.3, Interface address 10.10.1.5
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:01
  Supports Link-local Signaling (LLS)
  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 2.2.2.2  (Designated Router)
  Suppress hello for 0 neighbor(s)
FastEthernet0/0 is up, line protocol is up
  Internet Address 10.10.1.2/30, Area 0
  Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 1.1.1.1, Interface address 10.10.1.1
  Backup Designated router (ID) 3.3.3.3, Interface address 10.10.1.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:07
  Supports Link-local Signaling (LLS)
  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 1, Adjacent neighbor count is 1
    Adjacent with neighbor 1.1.1.1  (Designated Router)
  Suppress hello for 0 neighbor(s)
```

- show ip ospf neighbor

```
Router1#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
3.3.3.3           1   FULL/BDR        00:00:37    10.10.1.2       FastEthernet0/0
Router1#
```

```
R2#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
3.3.3.3           1   FULL/BDR        00:00:39    10.10.1.5       FastEthernet0/0
R2#
```

```
R3#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
2.2.2.2           1   FULL/DR         00:00:36    10.10.1.6       FastEthernet0/1
1.1.1.1           1   FULL/DR         00:00:34    10.10.1.1       FastEthernet0/0
R3#
```

Tarefa 5: Configure o encaminhamento EGP

Passo 1: Configure o BGP nos routers fronteira de acordo com a figura anterior.

ENTRE ROUTER 1 E ROUTER 4:

R1:

```
R1(config)#router bgp 1
R1(config-router)#neighbor 172.100.100.100 remote-as 100
R1(config-router)#network 1.1.1.0 mask 255.255.255.0
```

R4:

```
R4(config)#router bgp 100
R4(config-router)#neighbor 172.100.100.1 remote-as 1
R4(config-router)#
*Mar  1 00:05:53.879: %BGP-5-ADJCHANGE: neighbor 172.100.100.1 Up
```

ENTRE ROUTER 2 E ROUTER 5:

R2:

```
R2(config)#router bgp 1
R2(config-router)#neighbor 172.200.200.100 remote-as 200
R2(config-router)#network 2.2.2.0 mask 255.255.255.0
```

R5:

```
R5(config)#router bgp 200
R5(config-router)#neighbor 172.200.200.1 remote-as 1
R5(config-router)#
*Mar  1 00:06:54.555: %BGP-5-ADJCHANGE: neighbor 172.200.200.1 Up
```

ENTRE ROUTER 4 E ROUTER 5:

R4:

```
router bgp 100
 no synchronization
 bgp log-neighbor-changes
 network 4.4.4.0 mask 255.255.255.0
 network 100.100.0.0 mask 255.255.255.0
 network 172.100.100.0 mask 255.255.255.0
 network 192.168.1.0
 neighbor 172.100.100.10 remote-as 1
 neighbor 192.168.1.2 remote-as 200
 no auto-summary
```

R5:

```
router bgp 200
 no synchronization
 bgp log-neighbor-changes
 network 5.5.5.0 mask 255.255.255.0
 network 172.200.200.0 mask 255.255.255.0
 network 192.168.1.0 mask 255.255.255.252
 network 200.200.0.0
 neighbor 172.200.200.10 remote-as 1
 neighbor 192.168.1.1 remote-as 100
 no auto-summary
```

Passo 2: Interprete o resultado dos comandos seguintes:

i. show ip route

Router 1:

```
Router1#show ip route
Codes: 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
       i - IS-IS, su - IS-IS summary, 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

     1.0.0.0/24 is subnetted, 1 subnets
C       1.1.1.0 is directly connected, Loopback0
     2.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
O       2.2.2.2/32 [110/21] via 10.10.1.2, 00:01:42, FastEthernet0/0
B       2.2.2.0/24 [200/0] via 2.2.2.2, 00:01:03
     100.0.0.0/24 is subnetted, 1 subnets
B       100.100.0.0 [20/0] via 172.100.100.100, 00:01:03
     3.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
O       3.3.3.3/32 [110/11] via 10.10.1.2, 00:01:42, FastEthernet0/0
B       3.3.3.0/24 [200/0] via 10.10.1.2, 00:01:05
     4.0.0.0/24 is subnetted, 1 subnets
B       4.4.4.0 [20/0] via 172.100.100.100, 00:01:05
B    200.200.0.0/24 [200/0] via 2.2.2.2, 00:01:05
     5.0.0.0/24 is subnetted, 1 subnets
B       5.5.5.0 [200/0] via 2.2.2.2, 00:01:08
     172.200.0.0/24 is subnetted, 1 subnets
B       172.200.200.0 [200/0] via 2.2.2.2, 00:01:08
     172.100.0.0/24 is subnetted, 1 subnets
C       172.100.100.0 is directly connected, FastEthernet0/1
     10.0.0.0/30 is subnetted, 2 subnets
C       10.10.1.0 is directly connected, FastEthernet0/0
O       10.10.1.4 [110/20] via 10.10.1.2, 00:01:47, FastEthernet0/0
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
B       192.168.1.0/30 [200/0] via 2.2.2.2, 00:01:08
B       192.168.1.0/24 [20/0] via 172.100.100.100, 00:01:08
Router1#
```

Router 2:

```
R2#show ip route
Codes: 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
       i - IS-IS, su - IS-IS summary, 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

     1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
O       1.1.1.1/32 [110/21] via 10.10.1.5, 00:02:41, FastEthernet0/0
B       1.1.1.0/24 [200/0] via 1.1.1.1, 00:02:07
     2.0.0.0/24 is subnetted, 1 subnets
C       2.2.2.0 is directly connected, Loopback0
     100.0.0.0/24 is subnetted, 1 subnets
B       100.100.0.0 [200/0] via 1.1.1.1, 00:02:07
     3.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
O       3.3.3.3/32 [110/11] via 10.10.1.5, 00:02:41, FastEthernet0/0
B       3.3.3.0/24 [200/0] via 10.10.1.5, 00:02:09
     4.0.0.0/24 is subnetted, 1 subnets
B       4.4.4.0 [200/0] via 1.1.1.1, 00:02:09
B    200.200.0.0/24 [20/0] via 172.200.200.200, 00:02:09
     5.0.0.0/24 is subnetted, 1 subnets
B       5.5.5.0 [20/0] via 172.200.200.200, 00:02:10
     172.200.0.0/24 is subnetted, 1 subnets
C       172.200.200.0 is directly connected, FastEthernet0/1
     172.100.0.0/24 is subnetted, 1 subnets
B       172.100.100.0 [200/0] via 1.1.1.1, 00:02:10
     10.0.0.0/30 is subnetted, 2 subnets
O       10.10.1.0 [110/20] via 10.10.1.5, 00:02:44, FastEthernet0/0
C       10.10.1.4 is directly connected, FastEthernet0/0
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
B       192.168.1.0/30 [20/0] via 172.200.200.200, 00:02:10
B       192.168.1.0/24 [200/0] via 1.1.1.1, 00:02:10
R2#
```

Router 3:

```
R3#show ip route
Codes: 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
       i - IS-IS, su - IS-IS summary, 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

     1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
O       1.1.1.1/32 [110/11] via 10.10.1.1, 00:03:40, FastEthernet0/0
B       1.1.1.0/24 [200/0] via 10.10.1.1, 00:03:06
     2.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
O       2.2.2.2/32 [110/11] via 10.10.1.6, 00:03:40, FastEthernet0/1
B       2.2.2.0/24 [200/0] via 10.10.1.6, 00:03:06
     100.0.0.0/24 is subnetted, 1 subnets
B       100.100.0.0 [200/0] via 172.100.100.100, 00:03:01
     3.0.0.0/24 is subnetted, 1 subnets
C       3.3.3.0 is directly connected, Loopback0
     4.0.0.0/24 is subnetted, 1 subnets
B       4.4.4.0 [200/0] via 172.100.100.100, 00:03:03
B    200.200.0.0/24 [200/0] via 172.200.200.200, 00:03:03
     5.0.0.0/24 is subnetted, 1 subnets
B       5.5.5.0 [200/0] via 172.200.200.200, 00:03:04
     172.200.0.0/24 is subnetted, 1 subnets
B       172.200.200.0 [200/0] via 10.10.1.6, 00:03:09
     172.100.0.0/24 is subnetted, 1 subnets
B       172.100.100.0 [200/0] via 10.10.1.1, 00:03:09
     10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C       10.10.1.0/30 is directly connected, FastEthernet0/0
C       10.10.2.0/24 is directly connected, FastEthernet1/0
C       10.10.1.4/30 is directly connected, FastEthernet0/1
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
B       192.168.1.0/30 [200/0] via 172.200.200.200, 00:03:04
B       192.168.1.0/24 [200/0] via 172.100.100.100, 00:03:04
R3#
```

Router 4:

```
Router4#show ip route
Codes: 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
       i - IS-IS, su - IS-IS summary, 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

     1.0.0.0/24 is subnetted, 1 subnets
B       1.1.1.0 [20/0] via 172.100.100.10, 00:03:59
     2.0.0.0/24 is subnetted, 1 subnets
B       2.2.2.0 [20/0] via 172.100.100.10, 00:03:29
     100.0.0.0/24 is subnetted, 1 subnets
C       100.100.0.0 is directly connected, FastEthernet1/0
     3.0.0.0/24 is subnetted, 1 subnets
B       3.3.3.0 [20/0] via 172.100.100.10, 00:03:59
     4.0.0.0/24 is subnetted, 1 subnets
C       4.4.4.0 is directly connected, Loopback0
B    200.200.0.0/24 [20/0] via 192.168.1.2, 00:04:27
     5.0.0.0/24 is subnetted, 1 subnets
B       5.5.5.0 [20/0] via 192.168.1.2, 00:04:27
     172.200.0.0/24 is subnetted, 1 subnets
B       172.200.200.0 [20/0] via 192.168.1.2, 00:04:28
     172.100.0.0/24 is subnetted, 1 subnets
C       172.100.100.0 is directly connected, FastEthernet0/0
     10.0.0.0/30 is subnetted, 2 subnets
B       10.10.1.0 [20/0] via 172.100.100.10, 00:04:02
B       10.10.1.4 [20/0] via 172.100.100.10, 00:04:02
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
B       192.168.1.0/30 [20/0] via 192.168.1.2, 00:04:28
C       192.168.1.0/24 is directly connected, FastEthernet0/1
Router4#
```

Router 5:

```
Router5#show ip route
Codes: 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
       i - IS-IS, su - IS-IS summary, 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

     1.0.0.0/24 is subnetted, 1 subnets
B       1.1.1.0 [20/0] via 172.200.200.10, 00:04:31
     2.0.0.0/24 is subnetted, 1 subnets
B       2.2.2.0 [20/0] via 172.200.200.10, 00:04:31
     100.0.0.0/24 is subnetted, 1 subnets
B       100.100.0.0 [20/0] via 192.168.1.1, 00:04:57
     3.0.0.0/24 is subnetted, 1 subnets
B       3.3.3.0 [20/0] via 172.200.200.10, 00:04:31
     4.0.0.0/24 is subnetted, 1 subnets
B       4.4.4.0 [20/0] via 192.168.1.1, 00:04:57
C    200.200.0.0/24 is directly connected, FastEthernet1/0
     5.0.0.0/24 is subnetted, 1 subnets
C       5.5.5.0 is directly connected, Loopback0
     172.200.0.0/24 is subnetted, 1 subnets
C       172.200.200.0 is directly connected, FastEthernet0/1
     172.100.0.0/24 is subnetted, 1 subnets
B       172.100.100.0 [20/0] via 192.168.1.1, 00:05:00
     10.0.0.0/30 is subnetted, 2 subnets
B       10.10.1.0 [20/0] via 172.200.200.10, 00:04:34
B       10.10.1.4 [20/0] via 172.200.200.10, 00:04:34
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/30 is directly connected, FastEthernet0/0
B       192.168.1.0/24 [20/0] via 192.168.1.1, 00:05:00
Router5#
```

ii. show ip bgp

Router 1:

```
Router1#show ip bgp
BGP table version is 19, local router ID is 1.1.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 1.1.1.0/24       0.0.0.0                  0         32768 i
*>i2.2.2.0/24       2.2.2.2                  0    100      0 i
*>i3.3.3.0/24       10.10.1.2                0    100      0 i
*> 4.4.4.0/24       172.100.100.100          0             0 100 i
*>i5.5.5.0/24       2.2.2.2                  0    100      0 200 i
*                   172.100.100.100                        0 100 200 i
* i10.10.1.0/30     10.10.1.2                0    100      0 i
*>                  0.0.0.0                  0         32768 i
r i10.10.1.4/30     2.2.2.2                  0    100      0 i
r>i                 10.10.1.2                0    100      0 i
*> 100.100.0.0/24   172.100.100.100          0             0 100 i
*  172.100.100.0/24 172.100.100.100          0             0 100 i
*>                  0.0.0.0                  0         32768 i
*>i172.200.200.0/24 2.2.2.2                  0    100      0 i
*                   172.100.100.100                        0 100 200 i
*>i192.168.1.0/30   2.2.2.2                  0    100      0 200 i
*                   172.100.100.100                        0 100 200 i
   Network          Next Hop            Metric LocPrf Weight Path
*> 192.168.1.0      172.100.100.100          0             0 100 i
*>i200.200.0.0      2.2.2.2                  0    100      0 200 i
*                   172.100.100.100                        0 100 200 i
Router1#
```

Router 2:

```
R2#show ip bgp
BGP table version is 15, local router ID is 2.2.2.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*>i1.1.1.0/24       1.1.1.1                  0    100      0 i
*> 2.2.2.0/24       0.0.0.0                  0         32768 i
*>i3.3.3.0/24       10.10.1.5                0    100      0 i
*  4.4.4.0/24       172.200.200.200                       0 200 100 i
*>i                 1.1.1.1                  0    100      0 100 i
*> 5.5.5.0/24       172.200.200.200          0             0 200 i
r i10.10.1.0/30     1.1.1.1                  0    100      0 i
r>i                 10.10.1.5                0    100      0 i
* i10.10.1.4/30     10.10.1.5                0    100      0 i
*>                  0.0.0.0                  0         32768 i
*  100.100.0.0/24   172.200.200.200                       0 200 100 i
*>i                 1.1.1.1                  0    100      0 100 i
*  172.100.100.0/24 172.200.200.200                       0 200 100 i
*>i                 1.1.1.1                  0    100      0 i
*  172.200.200.0/24 172.200.200.200          0             0 200 i
*>                  0.0.0.0                  0         32768 i
*> 192.168.1.0/30   172.200.200.200          0             0 200 i
   Network          Next Hop            Metric LocPrf Weight Path
*  192.168.1.0      172.200.200.200                       0 200 100 i
*>i                 1.1.1.1                  0    100      0 100 i
*> 200.200.0.0      172.200.200.200          0             0 200 i
R2#
```

Router 3:

```
R3#show ip bgp
BGP table version is 14, local router ID is 3.3.3.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*>il.1.1.0/24       10.10.1.1                0    100      0 i
*>i2.2.2.0/24       10.10.1.6                0    100      0 i
*> 3.3.3.0/24       0.0.0.0                  0         32768 i
*>i4.4.4.0/24       172.100.100.100          0    100      0 100 i
*>i5.5.5.0/24       172.200.200.200          0    100      0 200 i
* il0.10.1.0/30     10.10.1.1                0    100      0 i
*>                  0.0.0.0                  0         32768 i
* il0.10.1.4/30     10.10.1.6                0    100      0 i
*>                  0.0.0.0                  0         32768 i
*>il00.100.0.0/24   172.100.100.100          0    100      0 100 i
*>il72.100.100.0/24 10.10.1.1                0    100      0 i
*>il72.200.200.0/24 10.10.1.6                0    100      0 i
*>il92.168.1.0/30   172.200.200.200          0    100      0 200 i
*>il92.168.1.0      172.100.100.100          0    100      0 100 i
*>i200.200.0.0      172.200.200.200          0    100      0 200 i
R3#
```

Router 4:

```
Router4#show ip bgp
BGP table version is 15, local router ID is 4.4.4.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*  1.1.1.0/24       192.168.1.2                           0 200 1 i
*>                  172.100.100.10           0            0 1 i
*> 2.2.2.0/24       172.100.100.10                        0 1 i
*                   192.168.1.2                           0 200 1 i
*  3.3.3.0/24       192.168.1.2                           0 200 1 i
*>                  172.100.100.10                        0 1 i
*> 4.4.4.0/24       0.0.0.0                  0         32768 i
*  5.5.5.0/24       172.100.100.10                        0 1 200 i
*>                  192.168.1.2              0            0 200 i
*  10.10.1.0/30     192.168.1.2                           0 200 1 i
*>                  172.100.100.10           0            0 1 i
*  10.10.1.4/30     192.168.1.2                           0 200 1 i
*>                  172.100.100.10                        0 1 i
*> 100.100.0.0/24   0.0.0.0                  0         32768 i
*  172.100.100.0/24 172.100.100.10           0            0 1 i
*>                  0.0.0.0                  0         32768 i
*  172.200.200.0/24 172.100.100.10                        0 1 i
   Network          Next Hop            Metric LocPrf Weight Path
*>                  192.168.1.2              0            0 200 i
*  192.168.1.0/30   172.100.100.10                        0 1 200 i
*>                  192.168.1.2              0            0 200 i
*> 192.168.1.0      0.0.0.0                  0         32768 i
*  200.200.0.0      172.100.100.10                        0 1 200 i
*>                  192.168.1.2              0            0 200 i
Router4#
```

Router 5:

```
Router5#show ip bgp
BGP table version is 14, local router ID is 5.5.5.5
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*  1.1.1.0/24       192.168.1.1                            0 100 1 i
*>                  172.200.200.10                         0 1 i
*  2.2.2.0/24       192.168.1.1                            0 100 1 i
*>                  172.200.200.10           0             0 1 i
*  3.3.3.0/24       192.168.1.1                            0 100 1 i
*>                  172.200.200.10                         0 1 i
*  4.4.4.0/24       172.200.200.10                         0 1 100 i
*>                  192.168.1.1              0             0 100 i
*> 5.5.5.0/24       0.0.0.0                  0         32768 i
*  10.10.1.0/30     192.168.1.1                            0 100 1 i
*>                  172.200.200.10                         0 1 i
*  10.10.1.4/30     192.168.1.1                            0 100 1 i
*>                  172.200.200.10           0             0 1 i
*  100.100.0.0/24   172.200.200.10                         0 1 100 i
*>                  192.168.1.1              0             0 100 i
*  172.100.100.0/24 172.200.200.10                         0 1 i
*>                  192.168.1.1              0             0 100 i
   Network          Next Hop            Metric LocPrf Weight Path
*  172.200.200.0/24 172.200.200.10           0             0 1 i
*>                  0.0.0.0                  0         32768 i
*> 192.168.1.0/30   0.0.0.0                  0         32768 i
*  192.168.1.0      172.200.200.10                         0 1 100 i
*>                  192.168.1.1              0             0 100 i
*> 200.200.0.0      0.0.0.0                  0         32768 i
Router5#
```

iii. show ip bgp summary

Router 1:

```
Router1#show ip bgp summary
BGP router identifier 1.1.1.1, local AS number 1
BGP table version is 19, main routing table version 19
13 network entries using 1521 bytes of memory
20 path entries using 1040 bytes of memory
6/4 BGP path/bestpath attribute entries using 744 bytes of memory
3 BGP AS-PATH entries using 72 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3377 total bytes of memory
BGP activity 13/0 prefixes, 20/0 paths, scan interval 60 secs

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
2.2.2.2         4     1      16      18       19    0    0 00:11:37        6
10.10.1.2       4     1      16      19       19    0    0 00:12:07        3
172.100.100.100 4   100      21      19       19    0    0 00:12:03        8
Router1#
```

Router 2:

```
R2#show ip bgp summary
BGP router identifier 2.2.2.2, local AS number 1
BGP table version is 15, main routing table version 15
13 network entries using 1521 bytes of memory
20 path entries using 1040 bytes of memory
6/4 BGP path/bestpath attribute entries using 744 bytes of memory
3 BGP AS-PATH entries using 72 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3377 total bytes of memory
BGP activity 13/0 prefixes, 24/4 paths, scan interval 60 secs

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
1.1.1.1         4     1      19      17       15    0    0 00:12:03        6
10.10.1.5       4     1      16      17       15    0    0 00:12:32        3
172.200.200.200 4   200      19      19       15    0    0 00:12:31        8
R2#
```

Router 3:

```
R3#show ip bgp summary
BGP router identifier 3.3.3.3, local AS number 1
BGP table version is 14, main routing table version 14
13 network entries using 1521 bytes of memory
15 path entries using 780 bytes of memory
5/4 BGP path/bestpath attribute entries using 620 bytes of memory
2 BGP AS-PATH entries using 48 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 2969 total bytes of memory
BGP activity 13/0 prefixes, 19/4 paths, scan interval 60 secs

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
1.1.1.1         4     1       0       0        0    0    0 never    Active
2.2.2.2         4     1       0       0        0    0    0 never    Active
10.10.1.1       4     1      19      16       14    0    0 00:12:55        6
10.10.1.6       4     1      17      16       14    0    0 00:12:54        6
R3#
```

Router 4:

```
Router4#show ip bgp summary
BGP router identifier 4.4.4.4, local AS number 100
BGP table version is 15, main routing table version 15
13 network entries using 1521 bytes of memory
23 path entries using 1196 bytes of memory
7/4 BGP path/bestpath attribute entries using 868 bytes of memory
4 BGP AS-PATH entries using 96 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3681 total bytes of memory
BGP activity 13/0 prefixes, 23/0 paths, scan interval 60 secs

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.100.100.10  4     1      20      22       15    0    0 00:13:23        10
192.168.1.2     4   200      20      22       15    0    0 00:13:22         9
Router4#
```

Router 5:

```
Router5#show ip bgp summary
BGP router identifier 5.5.5.5, local AS number 200
BGP table version is 14, main routing table version 14
13 network entries using 1521 bytes of memory
23 path entries using 1196 bytes of memory
7/4 BGP path/bestpath attribute entries using 868 bytes of memory
4 BGP AS-PATH entries using 96 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3681 total bytes of memory
BGP activity 13/0 prefixes, 23/0 paths, scan interval 60 secs

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.200.200.10  4     1      21      21       14    0    0 00:14:07        10
192.168.1.1     4   100      23      21       14    0    0 00:14:03         9
Router5#
```

iv. show ip bgp neighbors

Router 1:

```
Router1#show ip bgp neighbors
BGP neighbor is 2.2.2.2,  remote AS 1, internal link
  BGP version 4, remote router ID 2.2.2.2
  BGP state = Established, up for 00:14:07
  Last read 00:00:07, last write 00:00:07, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                4          2
    Keepalives:            16         16
    Route Refresh:          0          0
    Total:                 21         19
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP table version 19, neighbor version 19/0
 Output queue size : 0
  Index 3, Offset 0, Mask 0x8
  3 update-group member
  NEXT_HOP is always this router
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:             6          6 (Consumes 312 bytes)
    Prefixes Total:              10          6
    Implicit Withdraw:            0          0
    Explicit Withdraw:            4          0
    Used as bestpath:           n/a          5
    Used as multipath:          n/a          0

                                  Outbound    Inbound
  Local Policy Denied Prefixes:   --------    -------
    Bestpath from this peer:              5        n/a
    Bestpath from iBGP peer:              2        n/a
    Total:                                7          0
  Number of NLRIs in the update sent: max 4, min 3

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 255
Local host: 1.1.1.1, Local port: 179
Foreign host: 2.2.2.2, Foreign port: 54511

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0xDFCC0):
Timer          Starts    Wakeups            Next
Retrans            18          0             0x0
TimeWait            0          0             0x0
AckHold            18          4             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 2476475040  snduna: 2476475635  sndnxt: 2476475635     sndwnd:  16327
```

```
irs: 4139257890  rcvnxt: 4139258372  rcvwnd:      15903  delrcvwnd:    481

SRTT: 273 ms, RTTO: 490 ms, RTV: 217 ms, KRTT: 0 ms
minRTT: 56 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: passive open, nagle, gen tcbs
IP Precedence value : 6

Datagrams (max data segment is 536 bytes):
Rcvd: 35 (out of order: 0), with data: 18, total data bytes: 481
Sent: 23 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 18, total data bytes: 594

BGP neighbor is 10.10.1.2,  remote AS 1, internal link
  BGP version 4, remote router ID 3.3.3.3
  BGP state = Established, up for 00:14:46
  Last read 00:00:46, last write 00:00:46, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                4          1
    Keepalives:            16         16
    Route Refresh:          0          0
    Total:                 21         18
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP table version 19, neighbor version 19/0
 Output queue size : 0
  Index 2, Offset 0, Mask 0x4
  2 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:             6          3 (Consumes 156 bytes)
    Prefixes Total:              10          3
    Implicit Withdraw:            0          0
    Explicit Withdraw:            4          0
    Used as bestpath:           n/a          2
    Used as multipath:          n/a          0

                                 Outbound    Inbound
  Local Policy Denied Prefixes:  --------    -------
    Bestpath from this peer:              2        n/a
    Bestpath from iBGP peer:              5        n/a
    Total:                                7          0
  Number of NLRIs in the update sent: max 4, min 3

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 255
Local host: 10.10.1.1, Local port: 179
Foreign host: 10.10.1.2, Foreign port: 17512

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0xE1D7C):
Timer          Starts    Wakeups            Next
Retrans            18          0             0x0
```

```
TimeWait           0          0             0x0
AckHold           18         16             0x0
SendWnd            0          0             0x0
KeepAlive          0          0             0x0
GiveUp             0          0             0x0
PmtuAger           0          0             0x0
DeadWait           0          0             0x0

iss: 2421470959  snduna: 2421471554  sndnxt: 2421471554     sndwnd:  15790
irs:  674749771  rcvnxt:  674750186  rcvwnd:      15970  delrcvwnd:    414

SRTT: 273 ms, RTTO: 490 ms, RTV: 217 ms, KRTT: 0 ms
minRTT: 24 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: passive open, nagle, gen tcbs
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 21 (out of order: 0), with data: 18, total data bytes: 414
Sent: 35 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 18, total data bytes: 594

BGP neighbor is 172.100.100.100,  remote AS 100, external link
  BGP version 4, remote router ID 4.4.4.4
  BGP state = Established, up for 00:14:50
  Last read 00:00:52, last write 00:00:50, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                4          6
    Keepalives:            16         16
    Route Refresh:          0          0
    Total:                 21         23
  Default minimum time between advertisement runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 19, neighbor version 19/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                              Sent       Rcvd
  Prefix activity:            ----       ----
    Prefixes Current:           10          8 (Consumes 416 bytes)
    Prefixes Total:             10          8
    Implicit Withdraw:           0          0
    Explicit Withdraw:           0          0
    Used as bestpath:          n/a          3
    Used as multipath:         n/a          0

                                Outbound    Inbound
  Local Policy Denied Prefixes:    --------    -------
    AS_PATH loop:                       n/a          6
    Bestpath from this peer:              7        n/a
    Total:                                7          6
  Number of NLRIs in the update sent: max 3, min 2

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
```

```
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 172.100.100.10, Local port: 179
Foreign host: 172.100.100.100, Foreign port: 38108

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0xE3E78):
Timer          Starts    Wakeups            Next
Retrans            19          0             0x0
TimeWait            0          0             0x0
AckHold            20         19             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 2443800906  snduna: 2443801472  sndnxt: 2443801472     sndwnd:  15819
irs: 3167335826  rcvnxt: 3167336500  rcvwnd:      15711  delrcvwnd:    673

SRTT: 276 ms, RTTO: 466 ms, RTV: 190 ms, KRTT: 0 ms
minRTT: 32 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: passive open, nagle, gen tcbs
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 38 (out of order: 0), with data: 20, total data bytes: 673
Sent: 38 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 18, total data bytes: 565
Router1#
```

Router 2:

```
R2#show ip bgp neighbors
BGP neighbor is 1.1.1.1,  remote AS 1, internal link
  BGP version 4, remote router ID 1.1.1.1
  BGP state = Established, up for 00:17:37
  Last read 00:00:36, last write 00:00:36, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                2          4
    Keepalives:            19         19
    Route Refresh:          0          0
    Total:                 22         24
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP table version 15, neighbor version 15/0
 Output queue size : 0
  Index 3, Offset 0, Mask 0x8
  3 update-group member
  NEXT_HOP is always this router
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:             6          6 (Consumes 312 bytes)
    Prefixes Total:               6         10
    Implicit Withdraw:            0          0
    Explicit Withdraw:            0          4
    Used as bestpath:           n/a          5
    Used as multipath:          n/a          0

                                  Outbound    Inbound
  Local Policy Denied Prefixes:   --------    -------
    Bestpath from this peer:              5        n/a
    Bestpath from iBGP peer:              2        n/a
    Total:                                7          0
  Number of NLRIs in the update sent: max 3, min 3

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 255
Local host: 2.2.2.2, Local port: 54511
Foreign host: 1.1.1.1, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x1127F0):
Timer          Starts    Wakeups            Next
Retrans            22          0             0x0
TimeWait            0          0             0x0
AckHold            20         17             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 4139257890  snduna: 4139258429  sndnxt: 4139258429     sndwnd:  16384
```

```
irs: 2476475040  rcvnxt: 2476475692  rcvwnd:      16270  delrcvwnd:    114

SRTT: 284 ms, RTTO: 412 ms, RTV: 128 ms, KRTT: 0 ms
minRTT: 32 ms, maxRTT: 308 ms, ACK hold: 200 ms
Flags: active open, nagle
IP Precedence value : 6

Datagrams (max data segment is 536 bytes):
Rcvd: 27 (out of order: 0), with data: 21, total data bytes: 651
Sent: 41 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 21, total data bytes: 538

BGP neighbor is 10.10.1.5,  remote AS 1, internal link
  BGP version 4, remote router ID 3.3.3.3
  BGP state = Established, up for 00:18:11
  Last read 00:00:11, last write 00:00:12, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                2          1
    Keepalives:            20         20
    Route Refresh:          0          0
    Total:                 23         22
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP table version 15, neighbor version 15/0
 Output queue size : 0
  Index 2, Offset 0, Mask 0x4
  2 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:             6          3 (Consumes 156 bytes)
    Prefixes Total:               6          3
    Implicit Withdraw:            0          0
    Explicit Withdraw:            0          0
    Used as bestpath:           n/a          2
    Used as multipath:          n/a          0

                                 Outbound    Inbound
  Local Policy Denied Prefixes:  --------    -------
    Bestpath from this peer:              2        n/a
    Bestpath from iBGP peer:              5        n/a
    Total:                                7          0
  Number of NLRIs in the update sent: max 3, min 3

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 255
Local host: 10.10.1.6, Local port: 13508
Foreign host: 10.10.1.5, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x1145A0):
Timer          Starts    Wakeups            Next
Retrans            22          0             0x0
```

```
TimeWait           0          0             0x0
AckHold           21         20             0x0
SendWnd            0          0             0x0
KeepAlive          0          0             0x0
GiveUp             0          0             0x0
PmtuAger           0          0             0x0
DeadWait           0          0             0x0

iss: 3551996803  snduna: 3551997361  sndnxt: 3551997361     sndwnd:  15827
irs: 3791137102  rcvnxt: 3791137593  rcvwnd:      15894  delrcvwnd:    490

SRTT: 284 ms, RTTO: 413 ms, RTV: 129 ms, KRTT: 0 ms
minRTT: 28 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: active open, nagle
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 24 (out of order: 0), with data: 21, total data bytes: 490
Sent: 44 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 22, total data bytes: 557

BGP neighbor is 172.200.200.200,  remote AS 200, external link
  BGP version 4, remote router ID 5.5.5.5
  BGP state = Established, up for 00:18:18
  Last read 00:00:21, last write 00:00:17, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                4          4
    Keepalives:            20         20
    Route Refresh:          0          0
    Total:                 25         25
  Default minimum time between advertisement runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 15, neighbor version 15/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                              Sent       Rcvd
  Prefix activity:            ----       ----
    Prefixes Current:           10          8 (Consumes 416 bytes)
    Prefixes Total:             10          8
    Implicit Withdraw:           0          0
    Explicit Withdraw:           0          0
    Used as bestpath:          n/a          3
    Used as multipath:         n/a          0

                                Outbound    Inbound
  Local Policy Denied Prefixes:    --------    -------
    AS_PATH loop:                       n/a          5
    Bestpath from this peer:              3        n/a
    Total:                                3          5
  Number of NLRIs in the update sent: max 3, min 2

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 172.200.200.10, Local port: 31504
Foreign host: 172.200.200.200, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x115CDC):
Timer          Starts    Wakeups            Next
Retrans            24          1             0x0
TimeWait            0          0             0x0
AckHold            22         21             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 1675130237  snduna: 1675130878  sndnxt: 1675130878     sndwnd:  15744
irs: 2127982844  rcvnxt: 2127983502  rcvwnd:      15727  delrcvwnd:    657

SRTT: 284 ms, RTTO: 413 ms, RTV: 129 ms, KRTT: 0 ms
minRTT: 44 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: active open, nagle
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 44 (out of order: 0), with data: 22, total data bytes: 657
Sent: 46 (retransmit: 1, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 23, total data bytes: 640
R2#
```

Router 3:

```
R3#show ip bgp neighbors
BGP neighbor is 1.1.1.1,  remote AS 1, internal link
  BGP version 4, remote router ID 0.0.0.0
  BGP state = Active
  Last read 00:22:22, last write 00:22:22, hold time is 180, keepalive interval is 60 seconds
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  0          0
    Notifications:          0          0
    Updates:                0          0
    Keepalives:             0          0
    Route Refresh:          0          0
    Total:                  0          0
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP table version 14, neighbor version 0/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:             3          0
    Prefixes Total:               0          0
    Implicit Withdraw:            0          0
    Explicit Withdraw:            0          0
    Used as bestpath:           n/a          0
    Used as multipath:          n/a          0

                                 Outbound    Inbound
  Local Policy Denied Prefixes:  --------    -------
    Total:                                0          0
  Number of NLRIs in the update sent: max 0, min 0

  Connections established 0; dropped 0
  Last reset never
  No active TCP connection

BGP neighbor is 2.2.2.2,  remote AS 1, internal link
  BGP version 4, remote router ID 0.0.0.0
  BGP state = Active
  Last read 00:22:25, last write 00:22:25, hold time is 180, keepalive interval is 60 seconds
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  0          0
    Notifications:          0          0
    Updates:                0          0
    Keepalives:             0          0
    Route Refresh:          0          0
    Total:                  0          0
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP table version 14, neighbor version 0/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
```

```
    Prefixes Current:               3          0
    Prefixes Total:                 0          0
    Implicit Withdraw:              0          0
    Explicit Withdraw:              0          0
    Used as bestpath:             n/a          0
    Used as multipath:            n/a          0

                                  Outbound    Inbound
  Local Policy Denied Prefixes:   --------    -------
    Total:                               0          0
  Number of NLRIs in the update sent: max 0, min 0

  Connections established 0; dropped 0
  Last reset never
  No active TCP connection

BGP neighbor is 10.10.1.1,  remote AS 1, internal link
  BGP version 4, remote router ID 1.1.1.1
  BGP state = Established, up for 00:22:00
  Last read 00:00:00, last write 00:00:00, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                1          4
    Keepalives:            24         24
    Route Refresh:          0          0
    Total:                 26         29
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP table version 14, neighbor version 14/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:             3          6 (Consumes 312 bytes)
    Prefixes Total:               3         10
    Implicit Withdraw:            0          0
    Explicit Withdraw:            0          4
    Used as bestpath:           n/a          5
    Used as multipath:          n/a          0

                                  Outbound    Inbound
  Local Policy Denied Prefixes:   --------    -------
    Bestpath from this peer:              5        n/a
    Bestpath from iBGP peer:              5        n/a
    Total:                               10          0
  Number of NLRIs in the update sent: max 3, min 3

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 255
Local host: 10.10.1.2, Local port: 17512
Foreign host: 10.10.1.1, Foreign port: 179
```

```
Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x14C138):
Timer          Starts    Wakeups            Next
Retrans            27          0             0x0
TimeWait            0          0             0x0
AckHold            25          1             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss:  674749771  snduna:  674750338  sndnxt:  674750338     sndwnd:  15818
irs: 2421470959  rcvnxt: 2421471706  rcvwnd:      15638  delrcvwnd:    746

SRTT: 292 ms, RTTO: 359 ms, RTV: 67 ms, KRTT: 0 ms
minRTT: 36 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: active open, nagle
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 51 (out of order: 0), with data: 26, total data bytes: 746
Sent: 29 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 26, total data bytes: 566

BGP neighbor is 10.10.1.6,  remote AS 1, internal link
  BGP version 4, remote router ID 2.2.2.2
  BGP state = Established, up for 00:22:09
  Last read 00:00:08, last write 00:00:08, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                1          2
    Keepalives:            24         24
    Route Refresh:          0          0
    Total:                 26         27
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP table version 14, neighbor version 14/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:             3          6 (Consumes 312 bytes)
    Prefixes Total:               3          6
    Implicit Withdraw:            0          0
    Explicit Withdraw:            0          0
    Used as bestpath:           n/a          5
    Used as multipath:          n/a          0

                                 Outbound    Inbound
  Local Policy Denied Prefixes:  --------    -------
    Bestpath from this peer:              5        n/a
    Bestpath from iBGP peer:              5        n/a
    Total:                               10          0
```

```
    Total:                              10          0
  Number of NLRIs in the update sent: max 3, min 3

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 255
Local host: 10.10.1.5, Local port: 179
Foreign host: 10.10.1.6, Foreign port: 13508

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x14D9EC):
Timer          Starts    Wakeups            Next
Retrans            26          0             0x0
TimeWait            0          0             0x0
AckHold            25          2             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 3791137102  snduna: 3791137669  sndnxt: 3791137669     sndwnd:  15818
irs: 3551996803  rcvnxt: 3551997437  rcvwnd:      15751  delrcvwnd:    633

SRTT: 291 ms, RTTO: 368 ms, RTV: 77 ms, KRTT: 0 ms
minRTT: 40 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: passive open, nagle, gen tcbs
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 52 (out of order: 0), with data: 26, total data bytes: 633
Sent: 28 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 25, total data bytes: 566
R3#
```

Router 4:

```
Router4#show ip bgp neighbors
BGP neighbor is 172.100.100.10,  remote AS 1, external link
  BGP version 4, remote router ID 1.1.1.1
  BGP state = Established, up for 00:26:08
  Last read 00:00:06, last write 00:00:07, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                6          4
    Keepalives:            28         28
    Route Refresh:          0          0
    Total:                 35         33
  Default minimum time between advertisement runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 15, neighbor version 15/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:            13         10 (Consumes 520 bytes)
    Prefixes Total:              14         10
    Implicit Withdraw:            1          0
    Explicit Withdraw:            0          0
    Used as bestpath:           n/a          5
    Used as multipath:          n/a          0

                                  Outbound    Inbound
  Local Policy Denied Prefixes:   --------    -------
    Total:                               0          0
  Number of NLRIs in the update sent: max 4, min 1

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 172.100.100.100, Local port: 38108
Foreign host: 172.100.100.10, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x1887F0):
Timer          Starts    Wakeups            Next
Retrans            34          1             0x0
TimeWait            0          0             0x0
AckHold            30         28             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 3167335826  snduna: 3167336728  sndnxt: 3167336728     sndwnd:  15483
irs: 2443800906  rcvnxt: 2443801700  rcvwnd:      15591  delrcvwnd:    793

SRTT: 296 ms, RTTO: 327 ms, RTV: 31 ms, KRTT: 0 ms
```

```
Router4#show ip bgp neighbors
BGP neighbor is 172.100.100.10,  remote AS 1, external link
  BGP version 4, remote router ID 1.1.1.1
  BGP state = Established, up for 00:26:08
  Last read 00:00:06, last write 00:00:07, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                6          4
    Keepalives:            28         28
    Route Refresh:          0          0
    Total:                 35         33
  Default minimum time between advertisement runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 15, neighbor version 15/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                              Sent       Rcvd
  Prefix activity:            ----       ----
    Prefixes Current:           13         10 (Consumes 520 bytes)
    Prefixes Total:             14         10
    Implicit Withdraw:           1          0
    Explicit Withdraw:           0          0
    Used as bestpath:          n/a          5
    Used as multipath:         n/a          0

                                  Outbound    Inbound
  Local Policy Denied Prefixes:   --------    -------
    Total:                                0          0
  Number of NLRIs in the update sent: max 4, min 1

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 172.100.100.100, Local port: 38108
Foreign host: 172.100.100.10, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x1887F0):
Timer          Starts    Wakeups            Next
Retrans            34          1             0x0
TimeWait            0          0             0x0
AckHold            30         28             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 3167335826  snduna: 3167336728  sndnxt: 3167336728     sndwnd:  15483
irs: 2443800906  rcvnxt: 2443801700  rcvwnd:      15591  delrcvwnd:    793

SRTT: 296 ms, RTTO: 327 ms, RTV: 31 ms, KRTT: 0 ms
```

```
minRTT: 176 ms, maxRTT: 484 ms, ACK hold: 200 ms
Flags: active open, nagle
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 62 (out of order: 0), with data: 30, total data bytes: 793
Sent: 62 (retransmit: 1, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 32, total data bytes: 901

BGP neighbor is 192.168.1.2,  remote AS 200, external link
  BGP version 4, remote router ID 5.5.5.5
  BGP state = Established, up for 00:26:12
  Last read 00:00:12, last write 00:00:12, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                6          4
    Keepalives:            28         28
    Route Refresh:          0          0
    Total:                 35         33
  Default minimum time between advertisement runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 15, neighbor version 15/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:            13          9 (Consumes 468 bytes)
    Prefixes Total:              14          9
    Implicit Withdraw:            1          0
    Explicit Withdraw:            0          0
    Used as bestpath:           n/a          4
    Used as multipath:          n/a          0

                                 Outbound    Inbound
  Local Policy Denied Prefixes:  --------    -------
    AS_PATH loop:                     n/a          4
    Total:                              0          4
  Number of NLRIs in the update sent: max 4, min 1

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 192.168.1.1, Local port: 61553
Foreign host: 192.168.1.2, Foreign port: 179

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x189E18):
Timer          Starts    Wakeups            Next
Retrans            34          1             0x0
TimeWait            0          0             0x0
AckHold            28         27             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
```

```
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss:  357115078  snduna:  357115980  sndnxt:  357115980     sndwnd:  15483
irs: 1228770485  rcvnxt: 1228771295  rcvwnd:      15575  delrcvwnd:    809

SRTT: 296 ms, RTTO: 331 ms, RTV: 35 ms, KRTT: 0 ms
minRTT: 20 ms, maxRTT: 308 ms, ACK hold: 200 ms
Flags: active open, nagle
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 35 (out of order: 0), with data: 30, total data bytes: 809
Sent: 61 (retransmit: 1, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 32, total data bytes: 901
Router4#[0~[0~
```

Router 5:

```
Router5#show ip bgp neighbors
BGP neighbor is 172.200.200.10,  remote AS 1, external link
  BGP version 4, remote router ID 2.2.2.2
  BGP state = Established, up for 00:31:24
  Last read 00:00:21, last write 00:00:24, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                4          4
    Keepalives:            33         33
    Route Refresh:          0          0
    Total:                 38         38
  Default minimum time between advertisement runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 14, neighbor version 14/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:            13         10 (Consumes 520 bytes)
    Prefixes Total:              13         10
    Implicit Withdraw:            0          0
    Explicit Withdraw:            0          0
    Used as bestpath:           n/a          5
    Used as multipath:          n/a          0

                                 Outbound    Inbound
  Local Policy Denied Prefixes:  --------    -------
    Total:                                0          0
  Number of NLRIs in the update sent: max 4, min 2

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 172.200.200.200, Local port: 179
Foreign host: 172.200.200.10, Foreign port: 31504

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x1D4AA4):
Timer          Starts    Wakeups            Next
Retrans            36          0             0x0
TimeWait            0          0             0x0
AckHold            35         34             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 2127982844  snduna: 2127983749  sndnxt: 2127983749     sndwnd:  15480
irs: 1675130237  rcvnxt: 1675131125  rcvwnd:      15497  delrcvwnd:    887

SRTT: 298 ms, RTTO: 319 ms, RTV: 21 ms, KRTT: 0 ms
```

```
minRTT: 84 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: passive open, nagle, gen tcbs
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 72 (out of order: 0), with data: 36, total data bytes: 887
Sent: 70 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 35, total data bytes: 904

BGP neighbor is 192.168.1.1,  remote AS 100, external link
  BGP version 4, remote router ID 4.4.4.4
  BGP state = Established, up for 00:31:26
  Last read 00:00:26, last write 00:00:26, hold time is 180, keepalive interval is 60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                4          6
    Keepalives:            33         33
    Route Refresh:          0          0
    Total:                 38         40
  Default minimum time between advertisement runs is 30 seconds

 For address family: IPv4 Unicast
  BGP table version 14, neighbor version 14/0
 Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
                               Sent       Rcvd
  Prefix activity:             ----       ----
    Prefixes Current:            13          9 (Consumes 468 bytes)
    Prefixes Total:              13          9
    Implicit Withdraw:            0          0
    Explicit Withdraw:            0          0
    Used as bestpath:           n/a          4
    Used as multipath:          n/a          0

                                 Outbound    Inbound
  Local Policy Denied Prefixes:  --------    -------
    AS_PATH loop:                     n/a          5
    Total:                              0          5
  Number of NLRIs in the update sent: max 4, min 2

  Connections established 1; dropped 0
  Last reset never
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 192.168.1.2, Local port: 179
Foreign host: 192.168.1.1, Foreign port: 61553

Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)

Event Timers (current time is 0x1D6A00):
Timer          Starts    Wakeups            Next
Retrans            34          0             0x0
TimeWait            0          0             0x0
AckHold            37          4             0x0
SendWnd             0          0             0x0
KeepAlive           0          0             0x0
```

```
GiveUp              0          0             0x0
PmtuAger            0          0             0x0
DeadWait            0          0             0x0

iss: 1228770485  snduna: 1228771390  sndnxt: 1228771390     sndwnd:  15480
irs:  357115078  rcvnxt:  357116075  rcvwnd:      15388  delrcvwnd:    996

SRTT: 297 ms, RTTO: 325 ms, RTV: 28 ms, KRTT: 0 ms
minRTT: 136 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: passive open, nagle, gen tcbs
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 71 (out of order: 0), with data: 37, total data bytes: 996
Sent: 40 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 0), with data: 35, total data bytes: 904
Router5#
```

v. show ip bgp rib-failure

Router 1:

```
Router1#show ip bgp rib-failure
Network            Next Hop                  RIB-failure   RIB-NH Matches
10.10.1.4/30       10.10.1.2           Higher admin distance        n/a
Router1#
```

Router 2:

```
R2#show ip bgp rib-failure
Network            Next Hop                  RIB-failure   RIB-NH Matches
10.10.1.0/30       10.10.1.5           Higher admin distance        n/a
R2#
```

Router 3:

```
R3#show ip bgp rib-failure
Network            Next Hop                  RIB-failure   RIB-NH Matches
R3#
```

Router 4:

```
Router4#show ip bgp rib-failure
Network            Next Hop                  RIB-failure   RIB-NH Matches
Router4#
```

Router 5:

```
Router5#show ip bgp rib-failure
Network            Next Hop                  RIB-failure   RIB-NH Matches
Router5#
```

Passo 3: Efetue as configurações necessárias para que exista conectividade entre todas as redes do seu AS e as redes dos outros ASs.

Router 1 para Router 2:

```
Router1#ping 10.10.1.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/52/60 ms
Router1#ping 2.2.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/56/60 ms
Router1#ping 172.200.200.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.200.200.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/59/92 ms
Router1#
```

Router 1 para Router 3:

```
Router1#ping 10.10.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/32/44 ms
Router1#ping 3.3.3.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/28/32 ms
Router1#ping 10.10.1.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/32/40 ms
Router1#
```

Router 1 para Router 4:

```
Router1#ping 172.100.100.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.100.100.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/29/40 ms
Router1#ping 4.4.4.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 4.4.4.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/34/44 ms
Router1#ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/76/88 ms
Router1#
```

Router 1 para Router 5:

```
Router1#ping 192.168.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 76/87/92 ms
Router1#ping 5.5.5.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/91/120 ms
Router1#ping 172.200.200.200

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.200.200.200, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/87/104 ms
Router1#
```

Router 2 para Router 3:

```
R2#ping 10.10.1.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/27/32 ms
R2#ping 3.3.3.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/28/36 ms
R2#ping 10.10.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/28/40 ms
R2#
```

Router 2 para Router 4:

```
R2#ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/59/60 ms
R2#ping 4.4.4.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 4.4.4.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 88/92/104 ms
R2#ping 172.100.100.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.100.100.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 84/91/100 ms
R2#
```

Router 2 para Router 5:

```
R2#ping 192.168.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/32/40 ms
R2#ping 5.5.5.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/29/32 ms
R2#ping 172.200.200.200

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.200.200.200, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/34/52 ms
R2#
```

Router 3 para Router 4:

```
R3#ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 60/69/92 ms
R3#ping 4.4.4.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 4.4.4.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/58/72 ms
R3#ping 172.100.100.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.100.100.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/55/60 ms
R3#
```

Router 3 para Router 5:

```
R3#ping 192.168.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/59/72 ms
R3#ping 5.5.5.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/56/60 ms
R3#ping 172.200.200.200

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.200.200.200, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/56/60 ms
R3#
```

Router 4 para Router 5:

```
Router4#ping 192.168.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/31/36 ms
Router4#ping 5.5.5.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.5.5.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/28/32 ms
Router4#ping 172.200.200.200

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.200.200.200, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/27/32 ms
Router4#
```

Passo 3: Explique para que serve o comando: neighbor next-hop-self

Faz com que o dispositivo se liste como o próximo salto nas atualizações enviadas ao vizinho especificado.

Passo 4: Efetue as configurações necessárias de forma a que a rede 110.110.0.0/0 não seja importada para o IGP. (pista: use route-maps)

```
R1(config)#access-list 100 permit ip 110.110.0.0 0.0.0.0 255.255.0.0 0.0.0.0
R1(config)#rou
R1(config)#router bgp 1
R1(config-router)#nei
R1(config-router)#neighbor 172.100.100.100 filt
R1(config-router)#neighbor 172.100.100.100 filter-list 100 in
R1(config-router)#
```

```
R1#clear ip bgp *
R1#show i
*Mar  1 00:05:58.191: %BGP-5-ADJCHANGE: neighbor 2.2.2.2 Down User reset
*Mar  1 00:05:58.191: %BGP-5-ADJCHANGE: neighbor 10.10.1.2 Down User reset
*Mar  1 00:05:58.191: %BGP-5-ADJCHANGE: neighbor 172.100.100.100 Down User reset
*Mar  1 00:05:58.295: %BGP-5-ADJCHANGE: neighbor 172.100.100.100 Up
*Mar  1 00:05:58.667: %BGP-5-ADJCHANGE: neighbor 10.10.1.2 Up
R1#
*Mar  1 00:06:27.775: %BGP-5-ADJCHANGE: neighbor 2.2.2.2 Up
R1#show ip bgp
BGP table version is 15, local router ID is 1.1.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 1.1.1.0/24       0.0.0.0                  0         32768 i
*>i2.2.2.0/24       2.2.2.2                  0    100      0 i
*>i3.3.3.0/24       10.10.1.2                0    100      0 i
*>i4.4.4.0/24       2.2.2.2                  0    100      0 200 100 i
*>i5.5.5.0/24       2.2.2.2                  0    100      0 200 i
*> 10.10.1.0/30     0.0.0.0                  0         32768 i
* i                 10.10.1.2                0    100      0 i
r i10.10.1.4/30     2.2.2.2                  0    100      0 i
r>i                 10.10.1.2                0    100      0 i
*>i100.100.0.0/24   2.2.2.2                  0    100      0 200 100 i
*> 172.100.100.0/24 0.0.0.0                  0         32768 i
*>i172.200.200.0/24 2.2.2.2                  0    100      0 i
*>i192.168.1.0/30   2.2.2.2                  0    100      0 200 i
*>i192.168.1.0      2.2.2.2                  0    100      0 200 100 i
*>i200.200.0.0      2.2.2.2                  0    100      0 200 i
R1#
```

Passo 5: Efetue as configurações necessárias de forma a que o Router 1 seja o ponto de saída preferencial do tráfego gerado dentro AS X.

```
R1(config)#router bgp 1
R1(config-router)#nei
R1(config-router)#neighbor 10.10.1.2 rou
R1(config-router)#neighbor 10.10.1.2 route-m
R1(config-router)#neighbor 10.10.1.2 route-map LOc
R1(config-router)#neighbor 10.10.1.2 route-map LOC
R1(config-router)#neighbor 10.10.1.2 route-map LOCAL-PR
R1(config-router)#neighbor 10.10.1.2 route-map LOCAL-PREF-800 in
R1(config-router)#rout
R1(config-router)#route-m
R1(config-router)#route-map LOCAL-PREF-800
R1(config-route-map)#set loca
R1(config-route-map)#set local-preference 800
```

Passo 6: Efetue as configurações necessárias de forma a que o Router 1 seja o ponto de entrada preferencial no AS X.

```
R1(config)#route-map MED1 permit 100
R1(config-route-map)#set metric 200
R1(config-route-map)#exit
R1(config)#router bgp 1
R1(config-router)#nei
R1(config-router)#neighbor 172.100.100.100 rout
R1(config-router)#neighbor 172.100.100.100 route-map MED1 out
R1(config-router)#end
```

```
R1(config)#route-map MED2 permit 200
R1(config-route-map)#set metric 200
R1(config-route-map)#exiut
                     ^
% Invalid input detected at '^' marker.

R1(config-route-map)#exit
R1(config)#router bgp 1
R1(config-router)#neigh
R1(config-router)#neighbor 172.101.101.101 route-map MED2 out
R1(config-router)#exit
R1(config)#
```

Passo 7: Explique o processo utilizado pelo BGP para a seleção do melhor caminho.

O BGP tem vários algoritmos para selecionar o melhor caminho, ordenados da maior prioridade para a menor:

1º - Seleciona o caminho com o "peso" (*weight*) mais alto;

2º - Seleciona o caminho com a maior "*Local preference*";

3º - Seleciona o caminho que o router local originou;

4º - Seleciona o caminho com o menor AS Path;

5º - Seleciona o caminho com o menor *Origin Code* (IGP < EGP < Incomplete);

6º - Seleciona o caminho com o menor MED (multi-exit discriminator);

7º - Seleciona o caminho eBGP em vez do caminho iBGP;

8º - Seleciona o caminho com a menor métrica IGP;

9º - Seleciona o caminho recebido há mais tempo;

10º - Seleciona o caminho que vem do router com o menor Router ID;

11º - Seleciona o caminho que vem do vizinho com endereço menor.

Passo 8: Explique qual a função do comando do BGP neighbor update source e em que situações deve ser utilizado.

Permite utilizar um endereço IP de uma interface específica como origem da comunicação. Deve ser utilizado quando são configuradas interfaces loopback.