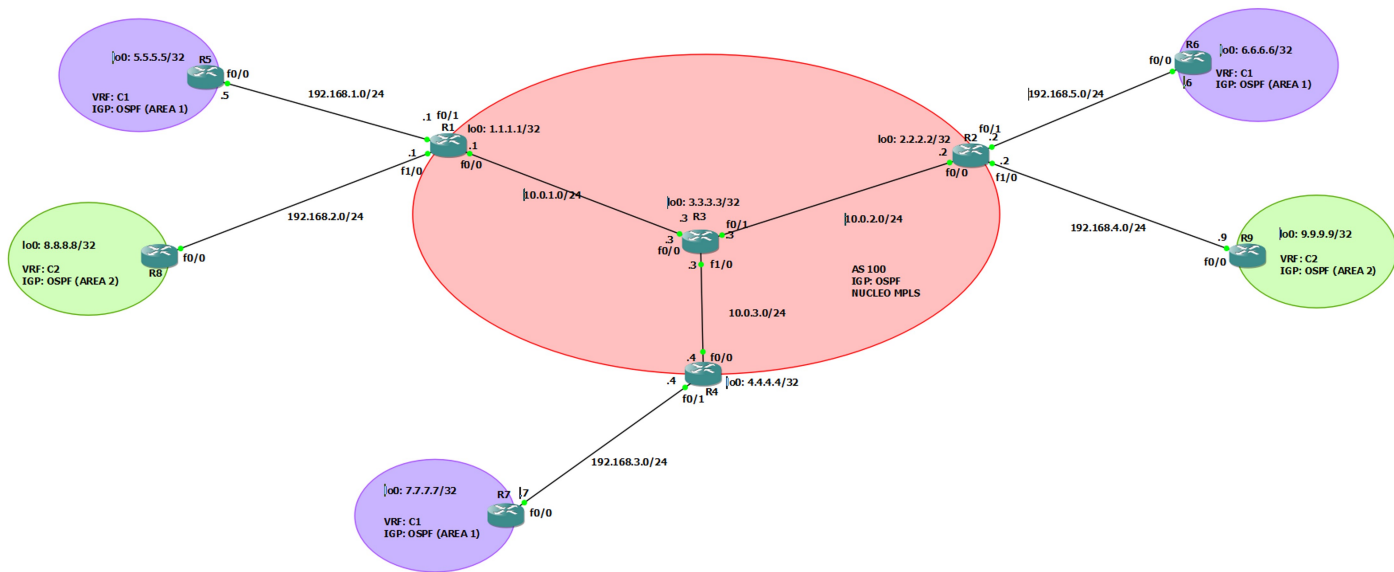


## Questão 2 - Prova

domingo, 4 de dezembro de 2022

17:47



Após a construção da topologia, é necessário a configuração dos roteadores.

### 1º Configurar endereço das interfaces

A configuração das interfaces dos roteadores foi realizada com base nos comandos da imagem abaixo:

```
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int lo0
R2(config-if)#ip addr
*Dec 4 17:53:07.071: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
R2(config-if)#ip addr 2.2.2.2 255.255.255.255
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#int f0/0
R2(config-if)#ip addr 10.0.2.2 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#ip addr 10.0.2.2 255.255.255.0
*Dec 4 17:54:44.623: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Dec 4 17:54:45.623: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config)#int f0/1
R2(config-if)#ip addr 192.168.5.2 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
*Dec 4 17:55:16.123: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Dec 4 17:55:17.123: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R2(config)#exit
R2(config)#int f1/0
R2(config-if)#ip addr 192.168.4.2 255.255.255.0
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#
```

### 2º Ativando OSPF nas interfaces

No enunciado da questão é especificado que o núcleo MPLS esta contido na parte vermelha, onde o tipo de IGP é OSPF, como não é apresentada uma área, irei considerar aqui **ÁREA 3**.

É ativado o protocolo OSPF nas interfaces lógicas e físicas contidas dentro da área vermelha e nas áreas 1 e 2. Os comando utilizados seguem exemplo da imagem abaixo

```
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int lo0
R2(config-if)#ip ospf 3 area 3
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#int f0/0
R2(config-if)#ip ospf 3 area 3
R2(config-if)#no shut
R2(config-if)#exit
R2(config)#
```

Após as ativação do OSPF, podemos verificar que é possível pingar via interface loopback, entre todos os roteadores que estão na Área 3.

```

R4#sh 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

  1.0.0.0/32 is subnetted, 1 subnets
O    1.1.1.1 [110/3] via 10.0.3.3, 00:10:40, FastEthernet0/0
  2.0.0.0/32 is subnetted, 1 subnets
O    2.2.2.2 [110/3] via 10.0.3.3, 00:10:40, FastEthernet0/0
  3.0.0.0/32 is subnetted, 1 subnets
O    3.3.3.3 [110/2] via 10.0.3.3, 00:10:40, FastEthernet0/0
  4.0.0.0/32 is subnetted, 1 subnets
C    4.4.4.4 is directly connected, Loopback0
 10.0.0.0/24 is subnetted, 3 subnets
O    10.0.2.0 [110/2] via 10.0.3.3, 00:10:40, FastEthernet0/0
C    10.0.3.0 is directly connected, FastEthernet0/0
O    10.0.1.0 [110/2] via 10.0.3.3, 00:10:40, FastEthernet0/0
C   192.168.3.0/24 is directly connected, FastEthernet0/1

```

## 2º Configurando MPLS

Agora precisamos de ativar o MPLS nas interfaces do núcleo. Para isso basta acessar o OSPF do roteador e executar o comando `mpls ldp autoconfig`. O processo deve ser feito em todos os roteadores da MPLS

```

R3#config t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 3
R3(config-router)#mpls ldp aut
R3(config-router)#mpls ldp autoconfig
R3(config-router)#
*Dec  4 19:26:07.287: %LDP-5-NBRCHG: LDP Neighbor 1.1.1.1:0 (1) is UP
R3(config-router)#end
R3#

```

Pode-se visualizar então que as interfaces do roteador esta utilizando MPLS através do comando `sh mpls interfaces`

```

R3#sh mpls interfaces
Interface          IP           Tunnel  BGP Static Operational
FastEthernet0/0    Yes (ldp)    No      No  No   Yes
FastEthernet0/1    Yes (ldp)    No      No  No   Yes
FastEthernet1/0    Yes (ldp)    No      No  No   Yes

```

## 3º Ativando BGP

Agora é necessário realizar a configuração dos roteadores de bordas, ativando o BGP.

```

R1# config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router bgp 100
R1(config-router)#nei
R1(config-router)#neighbor 2.2.2.2 remot
R1(config-router)#neighbor 2.2.2.2 remote-as 100
R1(config-router)#neighbor 4.4.4.4 remote-as 100
R1(config-router)#neighbor 2.2.2.2 upda
R1(config-router)#neighbor 2.2.2.2 update-source lop
R1(config-router)#neighbor 2.2.2.2 update-source 10
R1(config-router)#neighbor 2.2.2.2 update-source l0opback 0
R1(config-router)#neighbor 4.4.4.4 UPDA
R1(config-router)#neighbor 4.4.4.4 UPDate-source Lo
R1(config-router)#neighbor 4.4.4.4 UPDate-source Loopback 0
R1(config-router)#add
R1(config-router)#no auto
R1(config-router)#no auto-summary
R1(config-router)#add
R1(config-router)#address-family vpn4 uni
R1(config-router)#address-family vpnv4 un
R1(config-router)#address-family vpnv4 unicast
R1(config-router-af)#nei
R1(config-router-af)#neighbor 2.2.2.2 activate
R1(config-router-af)#neighbor 4.4.4.4 activate
R1(config-router-af)#exit
R1(config-router)#

```

Podemos visualizar se a conexão foi realizada corretamente

```

R1#sh bgp vpnv4 unicast all summary
BGP router identifier 1.1.1.1, local AS number 100
BGP table version is 1, main routing table version 1

Neighbor      V      AS  MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
2.2.2.2        4      100      12      12        1    0    0 00:04:51      0
4.4.4.4        4      100       7       9        1    0    0 00:01:35      0

```

## 4º Configurando VRFs

Para configurar as VRFs, primeiro deve-se criar a vrf e depois indicar a interface que conterà a

VRF, conforme a imagem

```
R4(config)#ip vrf c1
R4(config-vrf)#rd 4:4
R4(config-vrf)#route
R4(config-vrf)#route
R4(config-vrf)#route-target both 4:4
R4(config-vrf)#int f0/1
R4(config-if)#ip vrf fo
R4(config-if)#ip vrf forwarding c1
% Interface FastEthernet0/1 IP address 192.168.3.4 removed due to enabling VRF c1
R4(config-if)#int f0/1
R4(config-if)#ip add
R4(config-if)#ip address 192.168.3.1 255.255.255.0
R4(config-if)#ip ospf 1 area 1
R4(config-if)#no
*Dec 4 22:16:50.030: %OSPF-5-ADJCHG: Process 1, Nbr 7.7.7.7 on FastEthernet0/1 from LOADING to FULL, Loading Done
R4(config-if)#no shut
R4(config-if)#exi
```

Podemos visualizar agora a configuração presente na interface f0/1 do router R4, observa-se que o VRF esta ativo.

```
R4(config)#do sh run int f0/1
Building configuration...

Current configuration : 136 bytes
!
interface FastEthernet0/1
 ip vrf forwarding c1
 ip address 192.168.3.1 255.255.255.0
 ip ospf 1 area 1
 duplex auto
 speed auto
end
```

Agora deve-se redistribuir os VRF para que consiga pingar outra a VRF.

```
R1(config)#router bgp 100
R1(config-router)#adr
R1(config-router)#add
R1(config-router)#address-family ipv4 un
R1(config-router)#address-family ipv4 un
R1(config-router)#address-family ipv4 unic
R1(config-router)#address-family ipv4 u
R1(config-router)#address-family ipv4 unicast vrf c1
R1(config-router-af)#red
R1(config-router-af)#redistribute ospf 1
R1(config-router-af)#exit
R1(config-router)#add
R1(config-router)#address-family ipv4 u
R1(config-router)#address-family ipv4 unicast vrf c2
R1(config-router-af)#redistribute ospf 2
R1(config-router-af)#end
R1#
*Dec 4 23:37:40.807: %SYS-5-CONFIG_I: Configured from console by console
R1#
```

Deve-se fazer o mesmo processo só que usando o OSPF

```
R2(config-router-af)#router ospf 1
R2(config-router)#red
R2(config-router)#redistribute bgp 100 su
R2(config-router)#redistribute bgp 100 subnets
R2(config-router)#exit
R2(config)#router ospf 2
R2(config-router)#redistribute bgp 100 subnets
R2(config-router)#exit
R2(config)#
```

É possível visualizar que o router 6 já consegue visualizar a rede do router r5

```
R6# 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

 5.0.0.0/32 is subnetted, 1 subnets
O IA   5.5.5.5 [110/3] via 192.168.5.2, 00:02:25, FastEthernet0/0
 6.0.0.0/32 is subnetted, 1 subnets
C       6.6.6.6 is directly connected, Loopback0
 7.0.0.0/32 is subnetted, 1 subnets
O IA   7.7.7.7 [110/3] via 192.168.5.2, 00:02:25, FastEthernet0/0
C     192.168.5.0/24 is directly connected, FastEthernet0/0
O IA   192.168.1.0/24 [110/2] via 192.168.5.2, 00:02:25, FastEthernet0/0
O IA   192.168.3.0/24 [110/2] via 192.168.5.2, 00:02:25, FastEthernet0/0
R6#
```

Entretanto, ao contrário não é valido, por isso é necessário realizar as configurações anteriores em ambos os lados.

Observe o router 5 antes da configuração em ambos os lados

```

R5#sh 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

    5.0.0.0/32 is subnetted, 1 subnets
C       5.5.5.5 is directly connected, Loopback0
C    192.168.1.0/24 is directly connected, FastEthernet0/0

```

#### Após configuração

```

R5#sh 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

    5.0.0.0/32 is subnetted, 1 subnets
C       5.5.5.5 is directly connected, Loopback0
C       6.0.0.0/32 is subnetted, 1 subnets
O IA    6.6.6.6 [110/3] via 192.168.1.1, 00:02:10, FastEthernet0/0
    7.0.0.0/32 is subnetted, 1 subnets
O IA    7.7.7.7 [110/3] via 192.168.1.1, 00:02:10, FastEthernet0/0
O IA    192.168.5.0/24 [110/2] via 192.168.1.1, 00:02:10, FastEthernet0/0
C       192.168.1.0/24 is directly connected, FastEthernet0/0
O IA    192.168.3.0/24 [110/2] via 192.168.1.1, 00:02:10, FastEthernet0/0

```