Arquitetura de Redes Avançadas

Laboratory Guide

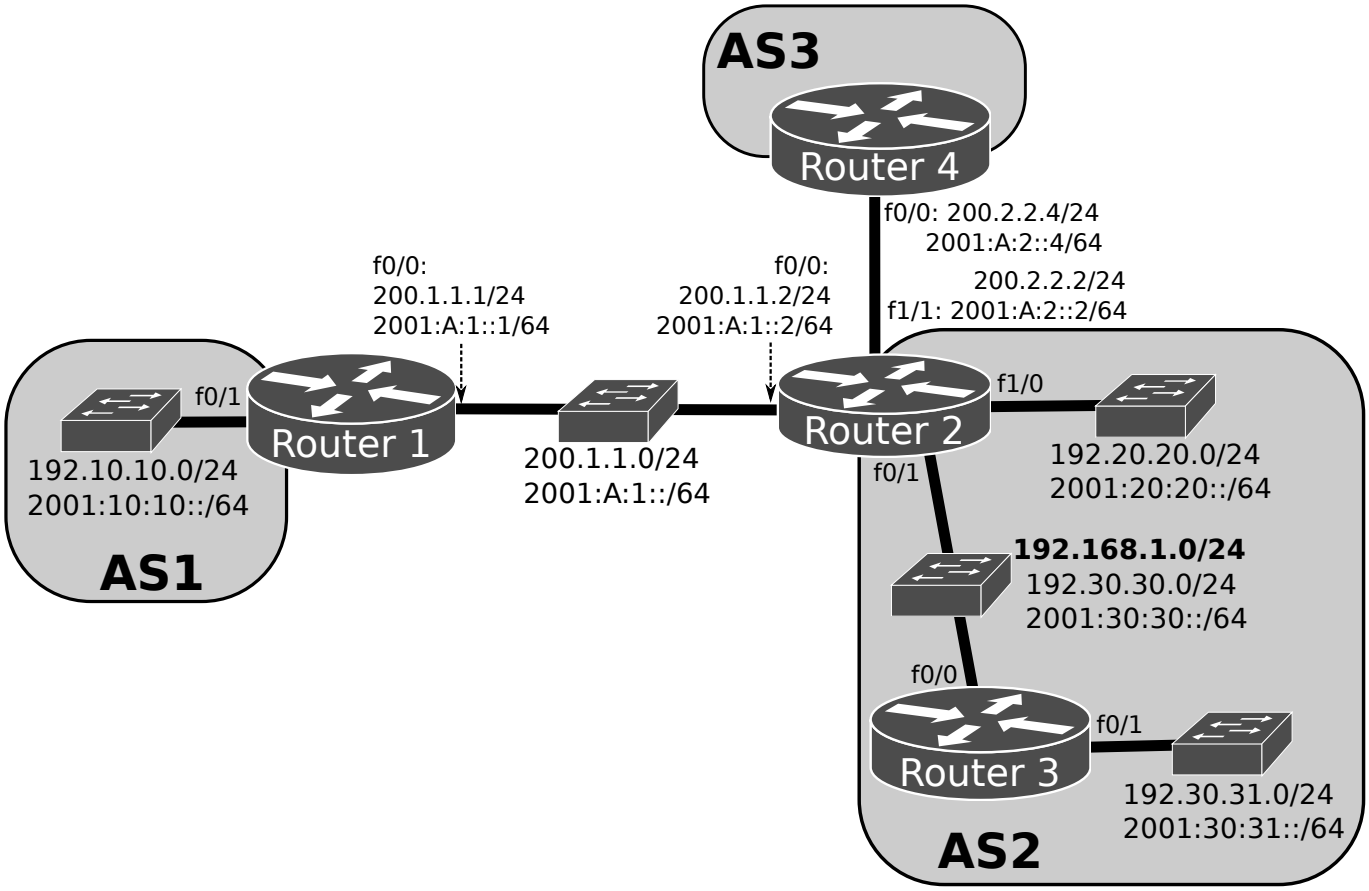
MP-BGP (part 1B)

Default Routes and Route Filtering

Objectives

- MP-BGP default route announcement.
- MP-BGP route filtering.

MP-BGP IPv4 private routes propagation



1. To the network assemble and configures on Part 1, add a new AS (AS3) with respective connection network, and add a IPv4 private network on AS2 to the LAN between Router 2 and Router 3 (and include it on OSPFv2 process 1):

```
Router2(config)# interface FastEthernet 0/1
Router2(config-if)# ip address 192.168.1.2 255.255.255.0 secondary
Router2(config)# router ospf 1
Router2(config-router)# network 192.168.1.0 0.0.0.255 area 0
---
Router2(config)# router bgp 2
Router2(config-router)# address-family ipv4 unicast
Router2(config-router-af)# neighbor 200.2.2.4 remote-as 3
Router2(config-router-af)# address-family ipv6 unicast
Router2(config-router-af)# neighbor 2001:A:2::4 remote-as 3
---
Router4(config)# router bgp 3
Router4(config-router)# address-family ipv4 unicast
Router4(config-router-af)# neighbor 200.2.2.2 remote-as 2
Router4(config-router-af)# address-family ipv6 unicast
Router4(config-router-af)# neighbor 2001:A:2::2 remote-as 2
```

Podemos concluir que o Router 2 propaga todas as redes que conhece, basicamente está por default a enviar todas as suas redes para todas as áreas

Analise the IPv4 and IPv6 routing tables (`show ip route`, `show ipv6 route`) and BGP tables (`show ip bgp`, `show bgp ipv6 unicast`). What can be concluded about the propagation of the IPv4 private network from AS2 to neighbors AS1 and AS3?

MP-BGP default route announcement and propagation

2. Configure Router 4 to announce IPv4 and IPv6 default routes to AS2:

```
Router4(config)# router bgp 3
Router4(config-router)# address-family ipv4 unicast
Router4(config-router-af)# neighbor 200.2.2.2 default-originate
Router4(config-router-af)# address-family ipv6 unicast
Router4(config-router-af)# neighbor 2001:A:2::2 default-originate
```

Analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ip bgp, show bgp ipv6 unicast`). What can be concluded about the propagation of the default routes to AS2m and to AS1 through AS2? Agora todas as rotas vão por default para o router 4

AS2 should NOT:

- Announce any IPv4 private network to its neighbors (strict rule!).
- Announce the default route to its neighbors (routing policy rule).

OR

- Accept the default route from AS3 (routing policy rule).

Route filtering with distribute lists

3.1. BGP route filtering with distribute lists require the definition of an ACL with the accepted and reject routes (permit and deny commands, respectively). The distribute list is then applied individually to each neighbor for received or sent announcements (in or out, respectively). Note: Distribution lists only work with IPv4 routes. To filter the announcement of IPv4 private networks and default routes from AS2 to AS1:

```
Router2(config)# ip access-list standard fOut-priv-default
Router2(config-std-nacl)#10 deny 10.0.0.0 0.255.255.255    !private route
Router2(config-std-nacl)#12 deny 172.16.0.0 0.15.255.255   !private route
Router2(config-std-nacl)#14 deny 192.168.0.0 0.0.255.255   !private route
Router2(config-std-nacl)#16 deny 0.0.0.0 0.0.0.0           !default route
Router2(config-std-nacl)#100 permit any             !to permit all others
---
Router2(config)#router bgp 2                                    !! Agora deixou de anunciar a rede privada
Router2(config-router)# address-family ipv4 unicast
Router2(config-router-af)# neighbor 200.1.1.1 distribute-list fOut-priv-default out
Router2(config-router-af)# neighbor 200.2.2.4 distribute-list fOut-priv-default out
```

Analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ip bgp, show bgp ipv6 unicast`), and identify the filtering results in Router1 and Router4.

3.2. To filter (at AS2) the reception of default routes from AS3:

```
Router2(config)# ip access-list standard fIn-default
Router2(config-std-nacl)#16 deny 0.0.0.0 0.0.0.0           !default route
Router2(config-std-nacl)#100 permit any                          !to permit all others
---
Router2(config)#router bgp 2
Router2(config-router)# address-family ipv4 unicast
router2(config-router-af)# neighbor 200.2.2.4 distribute-list fIn-default in
```

Reset the BGP relations between Router2 and Router4 (`clear ip bgp 200.2.2.4`). Analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ip bgp, show bgp ipv6 unicast`), and identify the filtering results in Router2.

Route filtering with prefix lists

4. Remove the distribute lists in Router2:

```
Router2(config)#router bgp 2
Router2(config-router)# address-family ipv4 unicast
Router2(config-router-af)# no neighbor 200.1.1.1 distribute-list fOut-priv-default out
Router2(config-router-af)# no neighbor 200.2.2.4 distribute-list fOut-priv-default out
Router2(config-router-af)# no neighbor 200.2.2.4 distribute-list fIn-default in
```

5.1. Reset the BGP relations of Router2 (`clear ip bgp *`). Analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ip bgp, show bgp ipv6 unicast`). Confirm the reappearance of default and IPv4 private routes in AS1.

To filter the announcement of IPv4 private networks and default routes from AS2 to AS1:

```
Router2(config)# ip prefix-list pOut-priv-default seq 10 deny 10.0.0.0/8 le 32
Router2(config)# ip prefix-list pOut-priv-default seq 12 deny 172.16.0.0/12 le 32
Router2(config)# ip prefix-list pOut-priv-default seq 14 deny 192.168.0.0/16 le 32
Router2(config)# ip prefix-list pOut-priv-default seq 16 deny 0.0.0.0/0        !default route
Router2(config)# ip prefix-list pOut-priv-default seq 100 permit 0.0.0.0/0 le 32
                                                                !All others
---
Router2(config)# ipv6 prefix-list pOut-default seq 16 deny ::/0
Router2(config)# ipv6 prefix-list pOut-default seq 100 permit ::/0 le 128
---
Router2(config)#router bgp 2
Router2(config-router)# address-family ipv4 unicast
Router2(config-router-af)# neighbor 200.1.1.1 prefix-list pOut-priv-default out
Router2(config-router-af)# neighbor 200.2.2.4 prefix-list pOut-priv-default out
Router2(config-router)# address-family ipv6   unicast
Router2(config-router-af)# neighbor 2001:A:1::1 prefix-list pOut-default out
Router2(config-router-af)# neighbor 2001:A:2::4 prefix-list pOut-default out
```

The subnet mask must be less than or equal to 32

When you add the keywords “GE” and “LE” to the prefix-list, the “len” value changes its meaning. When using GE and LE, the len value specifies how many bits of the prefix you are checking, starting with the most significant bit.

Analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ipsh ip ro bgp, show bgp ipv6 unicast`), and identify the filtering results in Router1. If necessary, reset the BGP relation between Router1 and Router2.

5.2. To filter (at AS2) the reception of default routes from AS3:

```
Router2(config)# ip prefix-list pIn-default seq 16 deny 0.0.0.0/0             !default route
Router2(config)# ip prefix-list pin-default seq 100 permit 0.0.0.0/0 le 32
                                                                  !All others
Router2(config)# ipv6 prefix-list pIn-default seq 16 deny ::/0
Router2(config)# ipv6 prefix-list pIn-default seq 100 permit ::/0 le 128
---
Router2(config)#router bgp 2
Router2(config-router)# address-family ipv4 unicast
Router2(config-router-af)# neighbor 200.2.2.4 prefix-list pIn-default in
Router2(config-router)# address-family ipv6   unicast
Router2(config-router-af)# neighbor 2001:A:2::4 prefix-list pIn-default in
```

Reset the BGP relation between Router2 and Router4, analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ip bgp, show bgp ipv6 unicast`), and identify the filtering results in Router2.

Route filtering with route-maps (and prefix lists)

6. Remove the prefix lists in Router2:

```
Router2(config)#router bgp 2
Router2(config-router)# address-family ipv4 unicast
Router2(config-router-af)# no neighbor 200.1.1.1 prefix-list pOut-priv-default out
Router2(config-router-af)# no neighbor 200.2.2.4 prefix-list pOut-priv-default out
Router2(config-router-af)# no neighbor 200.2.2.4 prefix-list pIn-default in
Router2(config-router)# address-family ipv6 unicast
Router2(config-router-af)# no neighbor 2001:A:1::1 prefix-list pOut-default out
Router2(config-router-af)# no neighbor 2001:A:2::4 prefix-list pOut-default out
Router2(config-router-af)# no neighbor 2001:A:2::4 prefix-list pIn-default in
```

~~7.1.~~ Reset the BGP relations of Router2 (`clear ip bgp *`). Analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ip bgp, show bgp ipv6 unicast`). Confirm the reappearance of default and IPv4 private routes in AS1.

To filter the announcement of IPv4 private networks and default routes from AS2 to AS1:

```
!prefix-lists to route-map match condition (must be true, therefore requires permit)
Router2(config)# ip prefix-list c-priv-default4 seq 10 permit 10.0.0.0/8 le 32
Router2(config)# ip prefix-list c-priv-default4 seq 12 permit 172.16.0.0/12 le 32
Router2(config)# ip prefix-list c-priv-default4 seq 14 permit 192.168.0.0/16 le 32
Router2(config)# ip prefix-list c-priv-default4 seq 16 permit 0.0.0.0/0       !default route
---                                                  entrar na condição
Router2(config)# ipv6 prefix-list c-default6 seq 16 permit ::/0
---
!route-maps (deny with condition, permit otherwise)
Router2(config)# route-map rm-priv-default4 deny 10
Router2(config-route-map)# match ip address prefix-list c-priv-default4
Router2(config-route-map)# route-map rm-priv-default4 permit 20
---
Router2(config)# route-map rm-default6 deny 10
Router2(config-route-map)# match ipv6 address prefix-list c-default6
Router2(config-route-map)# route-map rm-default6 permit 20
---
Router2(config)#router bgp 2
Router2(config-router)# address-family ipv4 unicast
Router2(config-router-af)# neighbor 200.1.1.1 route-map rm-priv-default4 out
Router2(config-router-af)# neighbor 200.2.2.4 route-map rm-priv-default4 out
Router2(config-router)# address-family ipv6   unicast
Router2(config-router-af)# neighbor 2001:A:1::1 route-map rm-default6 out
Router2(config-router-af)# neighbor 2001:A:2::4 route-map rm-default6 out
```

Reset the BGP relations of Router2 (`clear ip bgp *`). Analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ~~ipsh~~ ip ~~ro~~ bgp, show bgp ipv6 unicast`), and identify the filtering results in Router1.

~~7.2.~~ To filter (at AS2) the reception of default routes from AS3:

```
Router2(config)# ip~~v6~~ prefix-list c-default4 seq 16 permit 0.0.0.0/0
---
Router2(config)# route-map rm-default4 deny 10
Router2(config-route-map)# match ip address prefix-list c-default4
Router2(config-route-map)# route-map rm-default4 permit 20
---
Router2(config)#router bgp 2
Router2(config-router)# address-family ipv4 unicast
Router2(config-router-af)# neighbor 200.2.2.4 route-map rm-default4 ~~out~~  in
Router2(config-router)# address-family ipv6   unicast
Router2(config-router-af)# neighbor 2001:A:2::4 route-map rm-default6 ~~out~~ in
```

Reset the BGP relation between Router2 and Router4, analise the IPv4 and IPv6 routing tables (`show ip route, show ipv6 route`) and BGP tables (`show ip bgp, show bgp ipv6 unicast`), and identify the filtering results in Router2.