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Projektovanie sietí 1

MPLS/L3VPN

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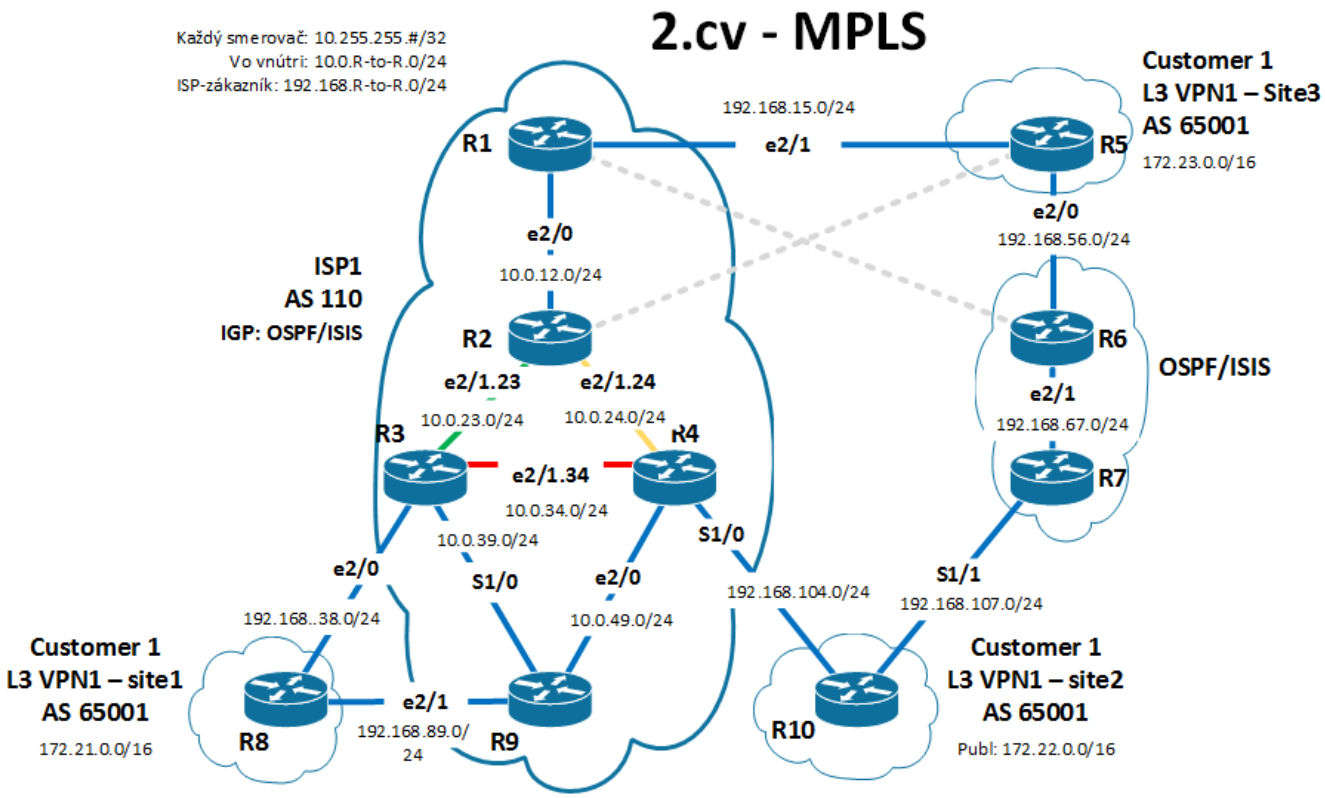

4. Adresovanie

Router	Interface	IP+Maska
R1	Lo0	10.255.255.1/32
	Fa0/0	10.0.12.1/24
	Fa0/1	192.168.15.1/24
R2	Lo0	10.255.255.2/32
	Fa0/0	10.0.12.2/24
	Fa0/1.23	10.0.23.2/24
	Fa0/1.24	10.0.24.2/24

R3	Lo0	10.110.255.3/32
	Fa0/0	192.168.38.1/24
	S1/0	10.0.39.1/24
	Fa0/1.23	10.0.23.3/24
	Fa0/1.34	10.0.34.3/24
R4	Lo0	10.110.255.4/30
	Fa0/0	10.0.49.1/24
	Fa0/1.24	10.0.24.4/24
	Fa0/1.34	10.0.34.4/24
	S1/0	192.168.104.1/24
R5	Lo0	10.255.255.5/32
	Lo1	172.23.1.1/32
	Lo2	172.23.2.1/32
	Lo3	172.23.3.1/32
	Fa0/0	192.168.15.5/24
	Fa0/1	192.168.56.5/24
R6	Lo0	10.33.255.6/32
	Fa0/0	10.33.56.6/24
	Fa0/1	10.33.67.6/24
R7	Lo0	10.33.255.7/32
	Fa0/1	10.33.67.7/24
	S1/1	172.22.107.7/24
R8	Lo0	10.255.255.8/32
	Lo1	172.21.1.1/32
	Lo2	172.21.2.1/32
	Lo3	172.21.3.1/32
	Fa0/0	192.168.38.2/24
	Fa0/1	192.168.89.1/24
R9	Lo0	10.255.255.9/32
	S1/0	10.0.39.2/24
	Fa0/0	10.0.49.2/24
	Fa0/1	192.168.89.2/24

R10	Lo0	10.255.255.10/32
	Lo1	172.22.1.1/24
	Lo2	172.22.2.1/24
	Lo3	172.22.3.1/24
	S1/0	192.168.104.2/24
	S1/1	192.168.107.10/24

5. ISIS alebo OSPF

V AS110 sme sa rozhodli použiť smerovací protokol IS-IS a rovnako tak aj medzi routrami R6-R7 a túto oblasť sme nazvali AS65002. Na všetkých týchto routroch sme použili L2-only prepoje. Ďalej sme na všetkých prepojoch nastavili point-to-point prepoje.

```
R4(config-if)#do sh isis nei

Tag null:
System Id      Type Interface   IP Address      State Holdtime Circuit Id
R2             L2   Fa0/1.24    10.0.24.1       UP    25       03
R3             L2   Fa0/1.34    10.0.34.1       UP    25       03
R9             L2   Fa0/0       10.0.49.2       UP    29       02


R6#sh isis nei

Tag null:
System Id      Type Interface   IP Address      State Holdtime Circuit Id
R7             L2   Fa0/1       192.168.67.7    UP    28       00
```

6. MPLS

Konfigurácia MPLS začína príkazom v globálnom režime `mpls ip`. Tento príkaz síce nie je povinný, keďže routre, ktoré používame ho majú už zadaný. Rovnaký príkaz `mpls ip` je nutné zadať aj na rozhraní, kde to už nie je predkonfigurované. Tento príkaz sme nastavili na každom rozhraní v AS110.

```
R4#sh mpls int
Interface              IP            Tunnel   BGP Static Operational
FastEthernet0/0        Yes (ldp)     No       No  No     Yes
FastEthernet0/1.24     Yes (ldp)     No       No  No     Yes
FastEthernet0/1.34     Yes (ldp)     No       No  No     Yes
```

7. LDP alebo RSVP

Už v predchádzajúcej časti je vidieť, že po zadaní príkazu `mpls ip` sa aktivuje aj LDP. Po zobrazení `sh mpls int` sme postrehli, že je spomenuté LDP:

```
Interface              IP            Tunnel   BGP Static Operational
FastEthernet0/0        Yes (ldp)     No       No  No     Yes
```

Aby LDP správne fungovalo, museli sme na všetkých routroch v AS110 zadať príkaz:
`mpls ldp router-id loopback 0 force`
Router-id reprezentuje loopback0 respektíve adresa loopbacku.

Po zadaní nasledujúceho príkazu vidíme susedov routra R4. Z výpisu je vidieť, že sú to routre R2,R3,R9.

```
R4(config)#do sh mpls ldp nei
    Peer LDP Ident: 10.255.255.2:0; Local LDP Ident 10.255.255.4:0
        TCP connection: 10.255.255.2.646 - 10.255.255.4.64897
        State: Oper; Msgs sent/rcvd: 61/62; Downstream
        Up time: 00:40:03
        LDP discovery sources:
          FastEthernet0/1.24, Src IP addr: 10.0.24.1
        Addresses bound to peer LDP Ident:
          10.255.255.2    10.0.12.2       10.0.23.1       10.0.24.1
    Peer LDP Ident: 10.255.255.3:0; Local LDP Ident 10.255.255.4:0
        TCP connection: 10.255.255.3.646 - 10.255.255.4.62350
        State: Oper; Msgs sent/rcvd: 61/64; Downstream
        Up time: 00:39:54
        LDP discovery sources:
          FastEthernet0/1.34, Src IP addr: 10.0.34.1
        Addresses bound to peer LDP Ident:
          10.255.255.3    10.0.23.2       10.0.34.1       10.0.39.1
    Peer LDP Ident: 10.255.255.9:0; Local LDP Ident 10.255.255.4:0
        TCP connection: 10.255.255.9.64069 - 10.255.255.4.646
        State: Oper; Msgs sent/rcvd: 61/64; Downstream
        Up time: 00:39:19
        LDP discovery sources:
          FastEthernet0/0, Src IP addr: 10.0.49.2
        Addresses bound to peer LDP Ident:
          10.255.255.9    10.0.49.2       10.0.39.2
```

8. RR alebo konfederácie

Route-reflector bol v našom prípade router R1. Tento router musel nadviazať susedstvá zo všetkými klientmi a to R3,R4 a R9.

Konfigurácia R1:

```
router bgp 110
nei ISP1 peer-group
nei ISP1 remote-as 110
nei ISP1 update-source lo0
nei 10.255.255.3 peer-group ISP1
nei 10.255.255.4 peer-group ISP1
nei 10.255.255.9 peer-group ISP1
address-family vpnv4
nei 10.255.255.3 activate
nei 10.255.255.4 activate
nei 10.255.255.9 activate
nei ISP1 route-reflector-client
```

Klienti R3,R4 a R9 nadviazali susedstvo len z R1.

Konfigurácia R3,R4,R9:

```
router bgp 110
nei 10.255.255.1 remote-as 110
nei 10.255.255.1 update-source lo0
address-family vpnv4
nei 10.255.255.1 activate
```

Overenie:

```
R1(config-router-af)#do sh bgp vpnv4 unicast all summary
BGP router identifier 10.255.255.1, local AS number 110
BGP table version is 15, main routing table version 15
11 network entries using 1716 bytes of memory
11 path entries using 880 bytes of memory
3/2 BGP path/bestpath attribute entries using 432 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
1 BGP extended community entries using 24 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 3076 total bytes of memory
BGP activity 11/0 prefixes, 11/0 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down
State/PfxRcd
10.255.255.3    4          110      62      64       15    0    0 00:53:51
0
10.255.255.4    4          110      62      64       15    0    0 00:53:22
3
10.255.255.9    4          110      62      63       15    0    0 00:52:51
3
192.168.15.5    4        65001      62      62       15    0    0 00:52:02
2
```

9. MP-BGP

V tomto okamihu sme mali vyriešené len smerovanie v rámci AS110. Komunikáciu ostatných routrov sme riešili pomocou VRF.
V rámci AS110 bolo nutné zadať nasledujúce príkazy na hraničných routroch (čiže všetkých okrem R2).

```
vrf definition Z1
address-family ipv4
exit
rd 110:10
route-target 110:1
```

Overenie VRF:

```
R3(config-if)#do sh vrf
  Name                             Default RD          Protocols
Interfaces
  Z1                               110:10              ipv4        Fa0/0
```

Na smerovačoch R1,R3,R4,R9 sme museli na rozhraniach, ktoré vedú k AS65001 nastaviť:

```
R1(config)#int fa0/1
R1(config-if)#vrf forwarding Z1
```

Ako ďalší krok bolo nutné nastaviť address-family ipv4 vrf Z1 s patričnými susedmi.

Konfigurácia R1:

```
router bgp 110
address-family ipv4 vrf Z1
nei 192.168.15.5 remote-as 65001
nei 192.168.15.5 activate
nei 192.168.15.5 as-override
```

Konfigurácia R4:

```
router bgp 110
address-family ipv4 vrf Z1
nei 192.168.104.2 remote-as 65001
nei 192.168.104.2 activate
nei 192.168.104.2 as-override
```

Konfigurácia R3:

```
router bgp 110
address-family ipv4 vrf Z1
nei 192.168.38.2 remote-as 65001
nei 192.168.38.2  activate
nei 192.168.38.2  as-override
```

Konfigurácia R9:

```
address-family ipv4 vrf Z1
neighbor 192.168.89.1 remote-as 65001
neighbor 192.168.89.1 activate
neighbor 192.168.89.1 as-override
```

To isté bolo treba spraviť aj v opačnom smere.

Konfigurácia R5:

```
router bgp 65001
no bgp default ipv4-unicast
nei 192.168.15.1 remote-as 110
address-family ipv4
nei 192.168.15.1 activate
```

Ďalej bolo nutné nastaviť as-override na hraničných routroch v AS110 a to kvôli tomu, aby sa nezahadzovali updaty z dôvodu, že sa jedná o slučku.

Konfigurácia R1:

```
router bgp 110
address-family ipv4 vrf Z1
nei 192.168.15.5 as-override
```

Konfigurácia R4:

```
router bgp 110
address-family ipv4 vrf Z1
nei 192.168.104.2 as-override
```

Konfigurácia R3:

```
router bgp 110
address-family ipv4 vrf Z1
nei 192.168.38.2  as-override
```

Konfigurácia R9:

```
address-family ipv4 vrf Z1
neighbor 192.168.89.1 as-override
```

V bgp tabuľke potom môžeme vidiet AS110 2-krát.

```
R8(config-if)#do sh bgp
...

     Network          Next Hop            Metric LocPrf Weight Path
 *>  10.255.255.8/32  0.0.0.0                  0         32768 ?
 *   10.255.255.10/32 192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
 *>  172.21.1.0/24    0.0.0.0                  0         32768 ?
 *>  172.21.2.0/24    0.0.0.0                  0         32768 ?
 *>  172.21.3.0/24    0.0.0.0                  0         32768 ?
 *   172.22.1.0/24    192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
 *   172.22.2.0/24    192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
 *   172.22.3.0/24    192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
 *   172.23.1.0/24    192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
 *   172.23.2.0/24    192.168.38.1                         0 110 110 ?
     Network          Next Hop            Metric LocPrf Weight Path
 *>                   192.168.89.2                         0 110 110 ?
 *   172.23.3.0/24    192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
 *   192.168.15.0     192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
 *>  192.168.38.0     0.0.0.0                  0         32768 ?
 *>  192.168.89.0     0.0.0.0                  0         32768 ?
 *   192.168.104.0    192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
 *   192.168.107.0    192.168.38.1                         0 110 110 ?
 *>                   192.168.89.2                         0 110 110 ?
```