

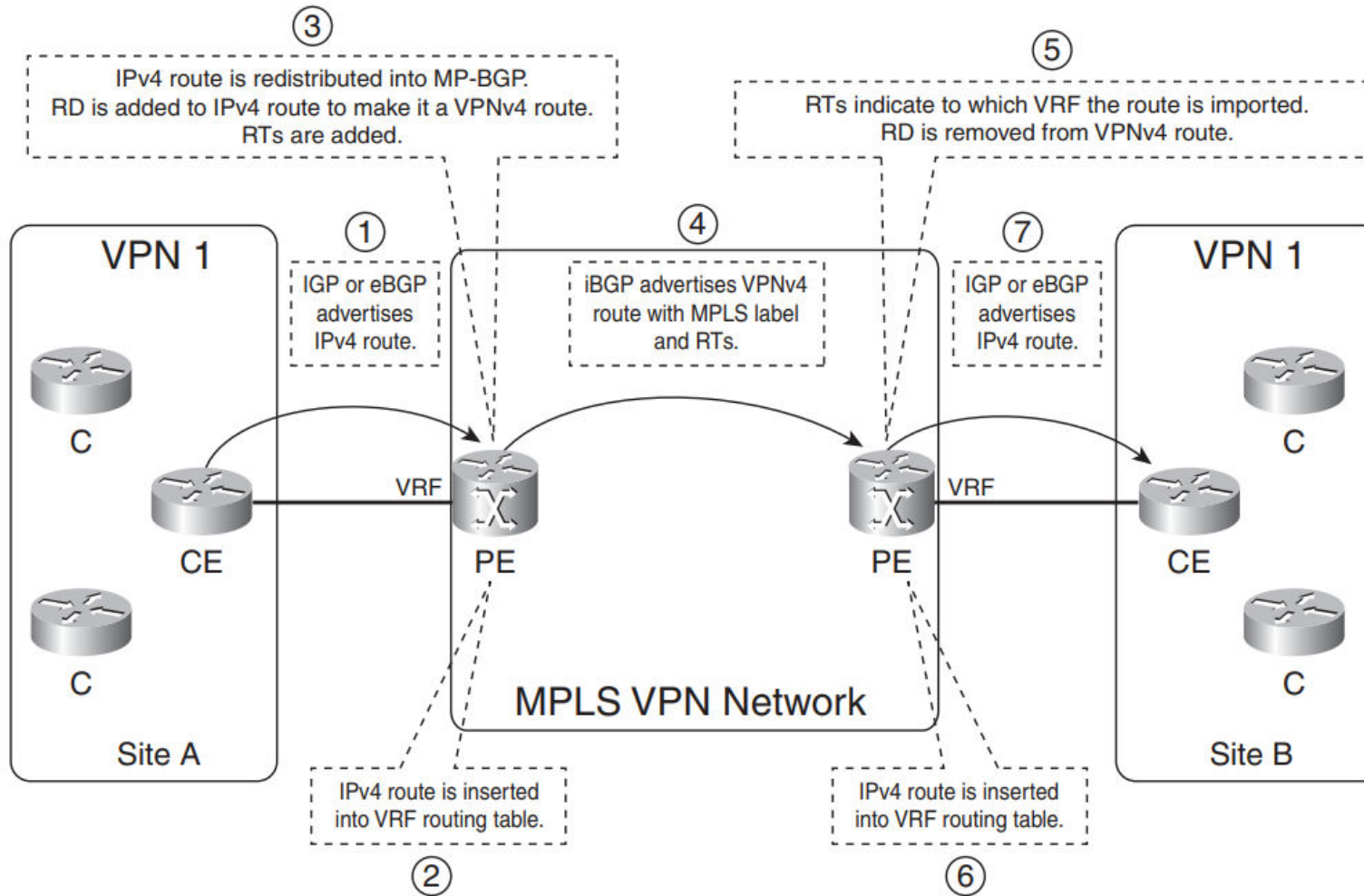
Hands-on Advanced Networking Topics: BGP, BGP Hijacking, MPLS, MPLS-based VPNs, Segment Routing, and others

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Lab 7: MPLS Layer 3 VPN

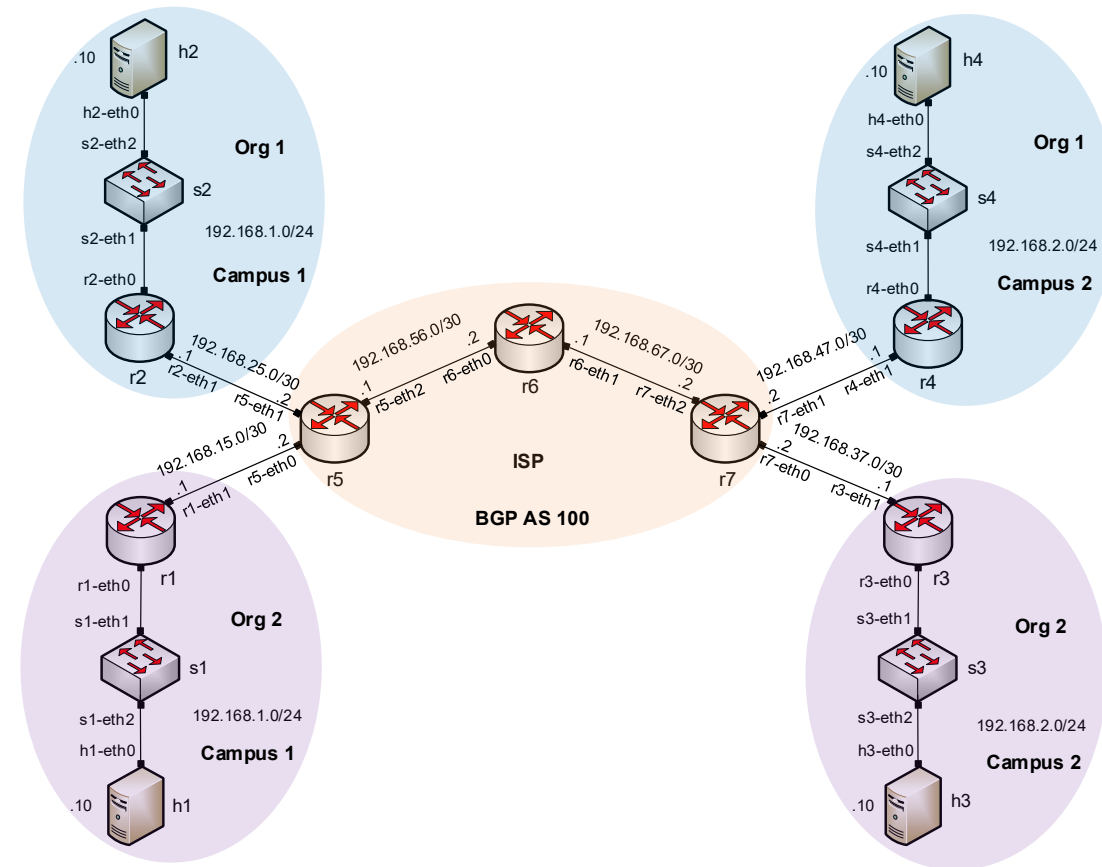
MPLS Layer 3 VPN configuration



1. L. De Ghein, "MPLS Fundamentals", Cisco Press, CCIE No. 1897, 2016.

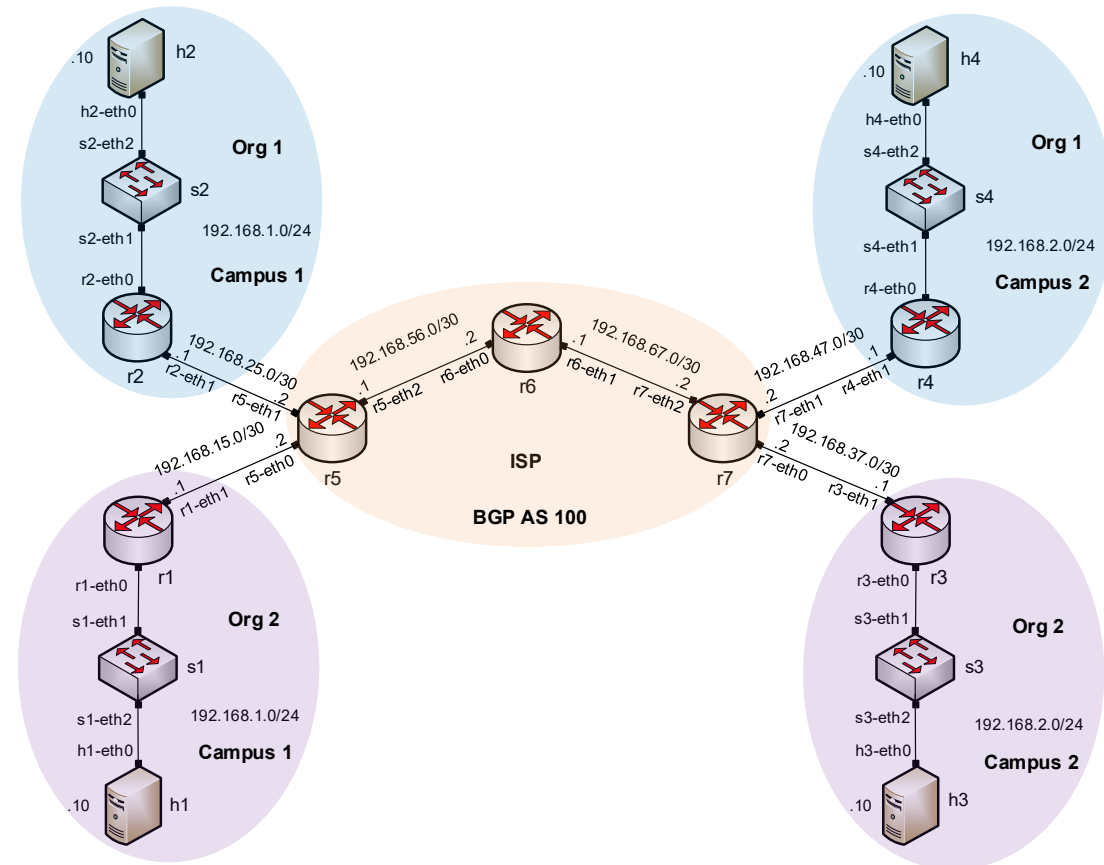
Lab Topology

- The Organizations (org 1 and org 2) are connected to ISP, having overlapping IP addresses
- Campus routers are connected to the ISP through static routes



Configuration steps

- Step 1
 - Run LDP within ISP routers
- Step 2
 - Create VRF for each organization in routers r5 and r7
- Step 3
 - Create BGP peers between routers r5 and r7
- Step 4
 - Advertise VPNv4 routes to the BGP peer



Lab configuration

- Verify BGP configuration for instance org1

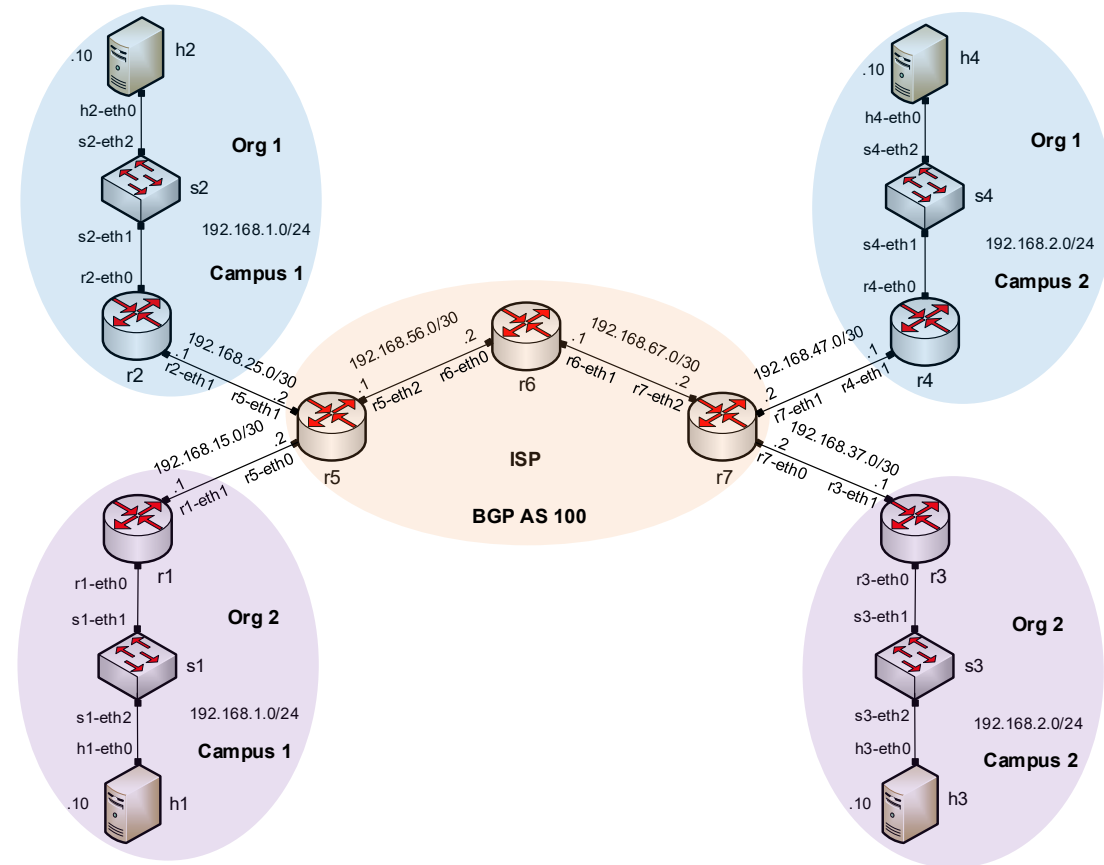
```
Host: r5
frr-pc# show bgp vrf all

Instance default:
No BGP prefixes displayed, 0 exist

Instance org1:
BGP table version is 4, local router ID is 192.168.25.2, vrf id 5
Default local pref 100, local AS 100
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, r RIB-failure, S Stale, R Removed
Nexthop codes: @NNN nexthop's vrf id, < announce-nh-self
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop        Metric LocPrf Weight Path
  *> 192.168.1.0/24  192.168.25.1      12         0   32768 ?
  *> 192.168.2.0/24  7.7.7.7@0<       12         0   0 ?
  *> 192.168.25.0/30 0.0.0.0           0          0  32768 ?
  *> 192.168.47.0/30 7.7.7.7@0<       0          0   0 ?

Displayed 4 routes and 4 total paths
```



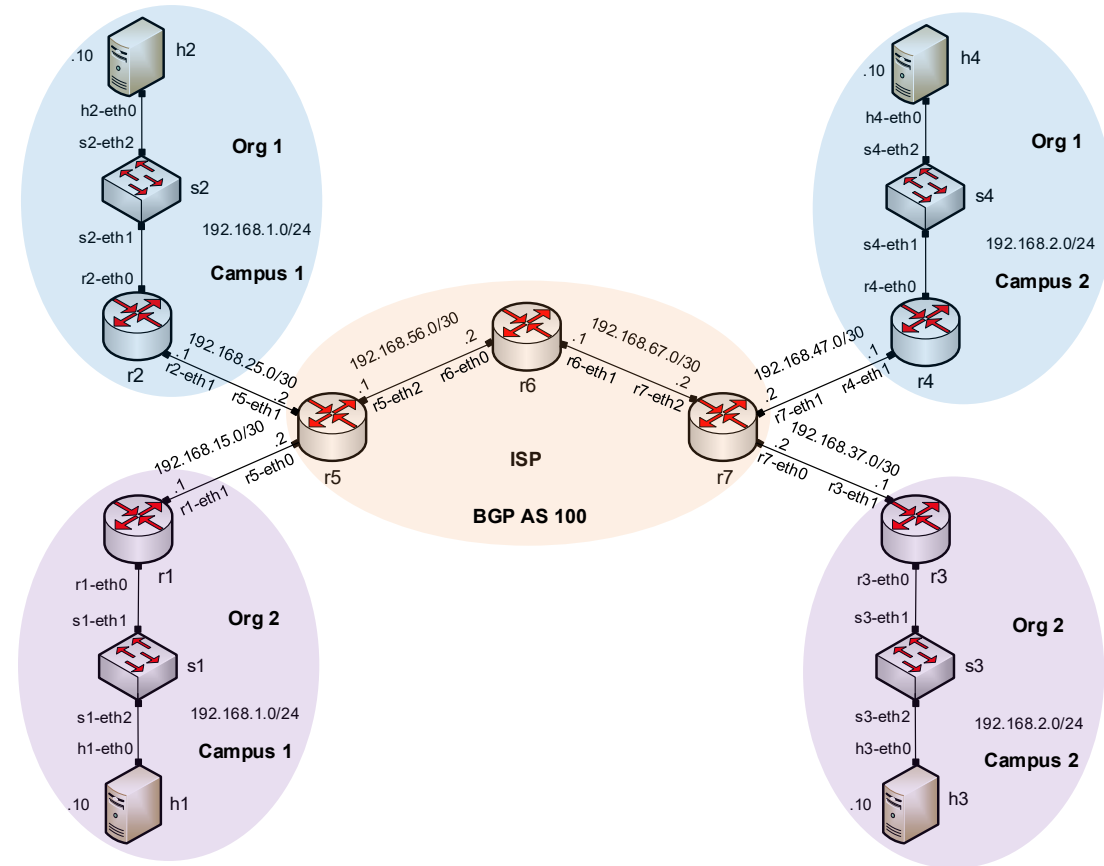
Lab configuration

- Verify BGP configuration for instance org2

```
Instance org2:
BGP table version is 4, local router ID is 192.168.15.2, vrf id 6
Default local pref 100, local AS 100
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
               i internal, r RIB-failure, S Stale, R Removed
Nexthop codes: @NNN nexthop's vrf id, < announce-nh-self
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network        Next Hop           Metric LocPrf Weight Path
*> 192.168.1.0/24  192.168.15.1         12         0 32768 ?
*> 192.168.2.0/24  7.7.7.7@0<          12        100     0 ?
*> 192.168.15.0/30 0.0.0.0              0          0 32768 ?
*> 192.168.37.0/30 7.7.7.7@0<          0          0     0 ?

Displayed 4 routes and 4 total paths
frr-pc#
```



Lab configuration

- Verify connectivity for org 1

```
Host: h2
root@frr-pc:~# traceroute 192.168.2.10
traceroute to 192.168.2.10 (192.168.2.10), 30 hops max, 60 byte packets
 1 192.168.1.1 (192.168.1.1)  1.919 ms  1.895 ms  1.882 ms
 2 * * *
 3 * * *
 4 192.168.47.1 (192.168.47.1)  1.759 ms  1.748 ms  1.735 ms
 5 192.168.2.10 (192.168.2.10)  2.097 ms  2.099 ms  2.096 ms
root@frr-pc:~#
```

- Verify connectivity for org 2

```
Host: h3
root@frr-pc:~# traceroute 192.168.1.10
traceroute to 192.168.1.10 (192.168.1.10), 30 hops max, 60 byte packets
 1 192.168.2.1 (192.168.2.1)  2.223 ms  2.195 ms  2.173 ms
 2 * * *
 3 * * *
 4 192.168.15.1 (192.168.15.1)  2.050 ms  2.039 ms  2.025 ms
 5 192.168.1.10 (192.168.1.10)  2.422 ms  2.369 ms  2.370 ms
root@frr-pc:~#
```

