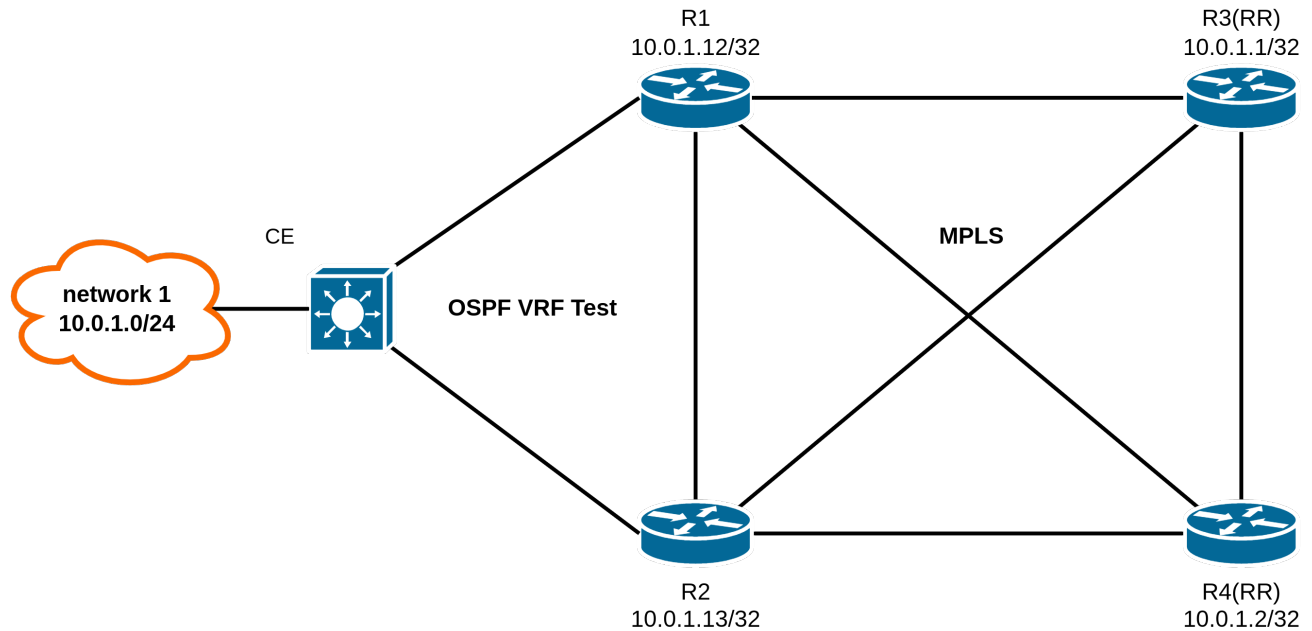


OSPF BGP VPNv4

OSPF VRF lite BGP VPNv4.

1.



1 —

1 :

R1, R2 — PE (Provider Edge) .

R3, R4 — RR (Route Reflectors) .

CE — Customer Edge router, 10.0.1.0/24.

CE OSPF VRF Test External Type 2.

OSPF CE:

```
!  
interface vlan 10  
 ip vrf Test  
 ip address 10.0.1.1 255.255.255.0  
exit  
!  
router ospf 1 vrf Test  
 network 10.11.0.0 area 0.0.0.0  
 network 10.11.0.2 area 0.0.0.0  
 network 10.11.15.12 area 0.0.0.0  
 router-id 10.11.15.12  
 redistribute connected metric-type type-2 subnets  
exit
```

CE , R1 R2.

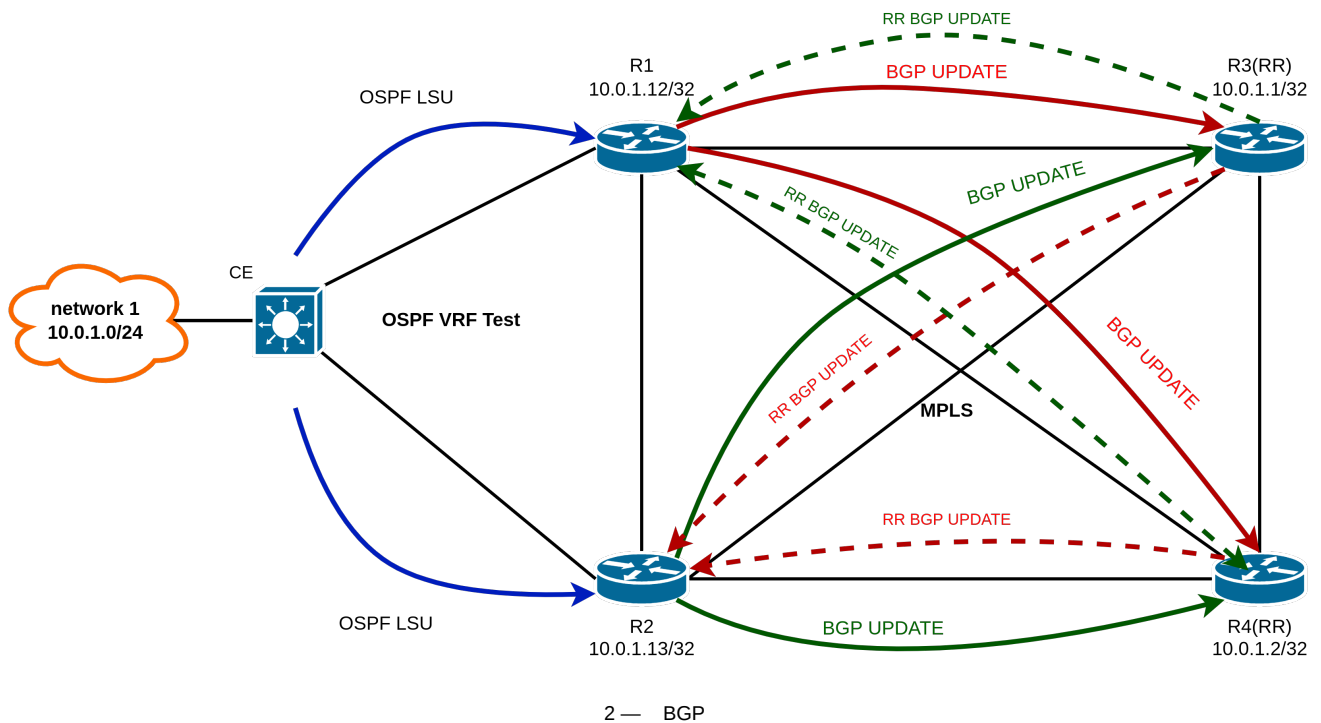
OSPF R1(R2):

```

outer ospfv2 Test
  vrf Test
    area 0.0.0.0
      interface loopback 10
        passive
      exit
      interface tengigabitethernet 0/0/1.100
        network point-to-point
      exit
    exit
  redistribution bgp 64500 < ===== BGP
    priority 20
  exit
  router-id 10.0.1.12
exit
exit

```

CE BGP, R3(RR) R4(RR), 2.



R3(RR) R4(RR) R2 R1. R1 R2 , BGP, OSPF.

R1 BGP R3 R4:

```

0/ME5100:R1# show bgp vpnv4 unicast rd 10.0.1.13:100 prefix 10.0.1.0/24
Fri Mar 17 18:17:34 2023
BGP router identifier 10.0.1.12, local AS number 65500
BGP routing table entry for 10.0.1.0/24
  Path #0
  AS path:
  RD 10.0.1.13:100, 10.0.1.13 from 10.0.1.1 (10.0.1.1), Source VRF: Test
  Received Label: 16
    Origin incomplete, metric 21, local-pref 100, weight 0, not-tracked, internal, best
    Address family: ipv4/vpn
    NLRI pathID: 0
    Aggregator AS: 0, Address: 0.0.0.0, Atomic aggregate: absent
    Extended Community: RT 65200:10 (0.0.0.10), ospf-route-type area 0.0.0.0router-type:0x05, metric-type:E2E1
    Cluster List: 1.1.1.1
    Originator ID: 10.0.1.13
    Is not stale, is not history
    Route flap penalty: 0, flap count 0, is not suppressed
    Route flap time left: 00:00:00, time start: never
    Route is not ECMP

  Path #1
  AS path:
  RD 10.0.1.13:100, 10.0.1.13 from 10.0.1.2 (10.0.1.2), Source VRF: Test
  Received Label: 16
    Origin incomplete, metric 21, local-pref 100, weight 0, not-tracked, internal
    Address family: ipv4/vpn
    NLRI pathID: 0
    Aggregator AS: 0, Address: 0.0.0.0, Atomic aggregate: absent
    Extended Community: RT 65200:10 (0.0.0.10), ospf-route-type area 0.0.0.0router-type:0x05, metric-type:E2E1
    Cluster List: 1.1.1.1
    Originator ID: 10.0.1.13
    Is not stale, is not history
    Route flap penalty: 0, flap count 0, is not suppressed
    Route flap time left: 00:00:00, time start: never
    Route is not ECMP
Total entries: 2

```

OSPF CE:

```

0/ME5100:R1# show ospfv2 vrf Test database detailed external
...
  LSA ID: 10.0.1.0
  Router-id: 10.11.15.12
  Age: 00:04:07
  Seq#: 0x800002A1
  Checksum: 0xede7
  Type: external-lsa
  Options: E
    LSA type: AS external link
    Length: 36
    Network Mask: 255.255.255.0
...

```

VRF Test:

```

0/ME5100:R1# show route vrf Test 10.0.1.0/24
Fri Mar 17 18:48:59 2023
Routing entry for 10.0.1.0/24
  Last update: 01w04d00h
  Routing Descriptor Blocks
    10.0.1.13
      Known via bgp, distance 200, metric 21 <=====
      type bgp-vpn, protection none, route-type remote
Entries: 1

```

R2.

OSPF CE:

```

0/ME5100:R2# show ospfv2 vrf Test database detailed external
...
  LSA ID: 10.0.1.0
  Router-id: 10.11.15.12
  Age: 00:07:15
  Seq#: 0x800002A1
  Checksum: 0xede7
  Type: external-lsa
  Options: E
    LSA type: AS external link
    Length: 36
    Network Mask: 255.255.255.0
...

```

VRF Test:

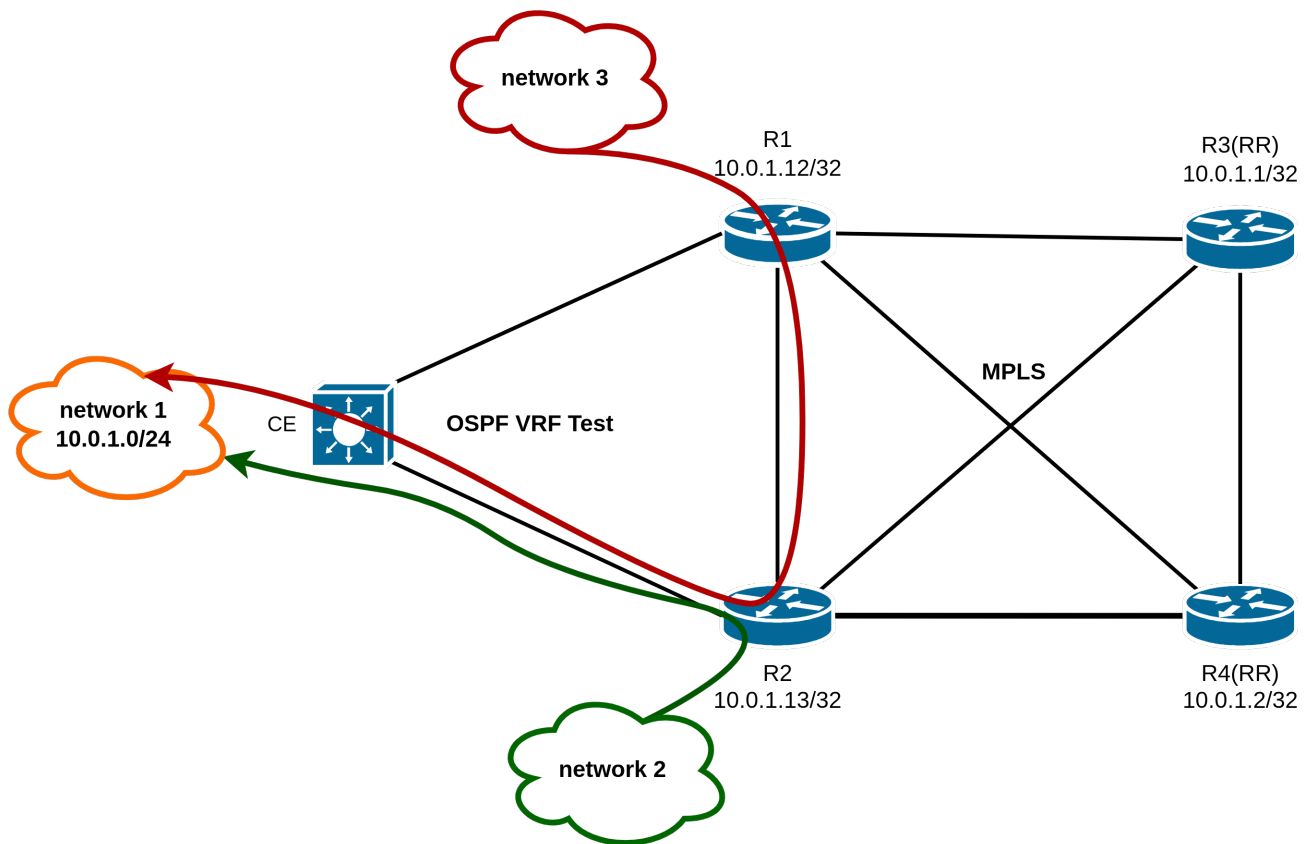
```

0/ME5100:R2# show route vrf Test 10.0.1.0/24
Fri Mar 17 18:41:00 2023
Routing entry for 10.0.1.0/24
  Last update: 02w00d01h
  Routing Descriptor Blocks
    10.11.0.2, via te0/0/12.12
      Known via ospf, distance 110, metric 20 <=====
      type ospf-type2-external, protection none, route-type remote
Entries: 1

```

: R1 , BGP, R2 , OSPF, .

3 R1 R2 CE.



3 —

?

R1 BGP, , vrf Test. R1 split horizon, R2 , OSPF.

R1 BGP?

, OSPF VRF BGP VPNv4 "vpn-pe-ce-support" (RFC 4577). , AD (Administrative Distance) .

BGP OSPF , Extended Communities attributes, MED (Multiexit Discriminator attribute), (cost) .

, , BGP , BGP, MED 0, OSPF .

(MED). "metric-conversion same". , RFC 4577 .: "metric-conversion same", R1 R2.

R1:

```
router ospfv2 Test
  vrf Test
    redistribution bgp 65500
    metric-conversion same <=====
  exit
exit
exit
```

, , OSPF, , BGP .

10.0.1.0/24 R1:

```

0/ME5100:R1# show route vrf Test 10.0.1.0/24
Fri Mar 17 19:27:24 2023
Routing entry for 10.0.1.0/24
  Last update: 00h00m49s
  Routing Descriptor Blocks
    10.11.0.0, via te0/0/12.11
      Known via ospf, distance 110, metric 20 <=====
      type ospf-type2-external, protection none, route-type remote

```

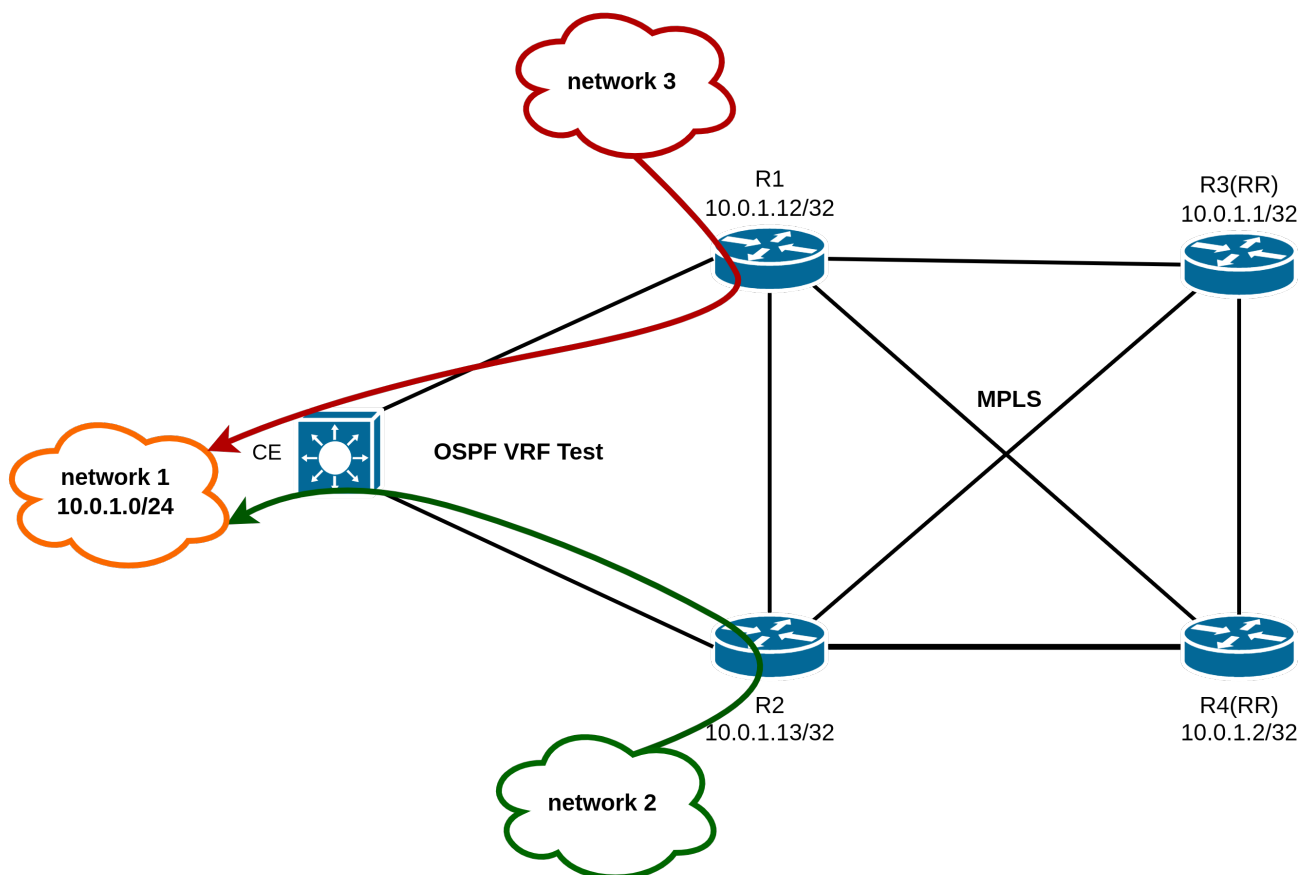
R2:

```

0/ME5100:R2# show route vrf Test 10.0.1.0/24
Fri Mar 17 19:29:38 2023
Routing entry for 10.0.1.0/24
  Last update: 02w00d02h
  Routing Descriptor Blocks
    10.11.0.2, via te0/0/12.12
      Known via ospf, distance 110, metric 20 <=====
      type ospf-type2-external, protection none, route-type remote

```

, R1 CE : 4.



LSU OSPF CE R1:

```
Frame 2: 98 bytes on wire (784 bits), 98 bytes captured (784 bits)
Ethernet II, Src: EltexEnt_10:ab:00 (e4:5a:d4:10:ab:00), Dst: IPv4mcast_05 (01:00:5e:00:00:05)
Internet Protocol Version 4, Src: 10.11.0.0, Dst: 224.0.0.5
Open Shortest Path First
  OSPF Header
  LS Update Packet
    Number of LSAs: 1
    LSA-type 5 (AS-External-LSA (ASBR)), len 36
      .000 1110 0001 0000 = LS Age (seconds): 3600
      0... .... .... .... = Do Not Age Flag: 0
      Options: 0x02, (E) External Routing
      LS Type: AS-External-LSA (ASBR) (5)
      Link State ID: 10.0.1.0
      Advertising Router: 10.11.15.12
      Sequence Number: 0x8000033c
      Checksum: 0xb584
      Length: 36
      Netmask: 255.255.255.0
      1... .... = External Type: Type 2 (metric is larger than any other link state path)
      .000 0000 = TOS: 0
      Metric: 20 <=====
      Forwarding Address: 0.0.0.0
      External Route Tag: 0
```

20.

BGP Update R2 R4(RR):

```

Frame 119: 598 bytes on wire (4784 bits), 598 bytes captured (4784 bits)
Ethernet II, Src: EltexEnt_de:01:e7 (e4:5a:d4:de:01:e7), Dst: EltexEnt_5b:2e:27 (e4:5a:d4:5b:2e:27)
Internet Protocol Version 4, Src: 10.0.1.13, Dst: 10.0.1.2
Transmission Control Protocol, Src Port: 42498, Dst Port: 179, Seq: 150, Ack: 175, Len: 532
Border Gateway Protocol - UPDATE Message
  Marker: ffffffffffffffffffffffffffffffff
  Length: 99
  Type: UPDATE Message (2)
  Withdrawn Routes Length: 0
  Total Path Attribute Length: 76
  Path attributes
    Path Attribute - ORIGIN: INCOMPLETE
      Flags: 0x40, Transitive, Well-known, Complete
      Type Code: ORIGIN (1)
      Length: 1
      Origin: INCOMPLETE (2)
    Path Attribute - AS_PATH: empty
      Flags: 0x40, Transitive, Well-known, Complete
      Type Code: AS_PATH (2)
      Length: 0
    Path Attribute - MULTI_EXIT_DISC: 21
      Flags: 0x80, Optional, Non-transitive, Complete
      Type Code: MULTI_EXIT_DISC (4)
      Length: 4
      Multiple exit discriminator: 21 <=====
    Path Attribute - LOCAL_PREF: 100
      Flags: 0x40, Transitive, Well-known, Complete
      Type Code: LOCAL_PREF (5)
      Length: 4
      Local preference: 100
    Path Attribute - EXTENDED_COMMUNITIES
      Flags: 0xc0, Optional, Transitive, Complete
      Type Code: EXTENDED_COMMUNITIES (16)
      Length: 16
      Carried extended communities: (2 communities)
        Route Target: 65200:10 [Transitive 2-Octet AS-Specific]
          Type: Transitive 2-Octet AS-Specific (0x00)
          Subtype (AS2): Route Target (0x02)
          2-Octet AS: 65200
          4-Octet AN: 10
        OSPF Route Type: Area: 0.0.0.0, Type: External [Transitive Opaque]
          Type: Transitive Opaque (0x03)
          Subtype (Opaque): OSPF Route Type (0x06)
          Area ID: 0.0.0.0
          Route type: External (5)
          Options: 0x01 (Metric: Type-2)
    Path Attribute - MP_REACH_NLRI
      Flags: 0x90, Optional, Extended-Length, Non-transitive, Complete
      Type Code: MP_REACH_NLRI (14)
      Length: 32
      Address family identifier (AFI): IPv4 (1)
      Subsequent address family identifier (SAFI): Labeled VPN Unicast (128)
      Next hop: RD=0:0 IPv4=10.0.1.13
      Number of Subnetwork points of attachment (SNPA): 0
      Network Layer Reachability Information (NLRI)
        BGP Prefix
          Prefix Length: 112
          Label Stack: 16 (bottom)
          Route Distinguisher: 10.0.1.13:100
          MP Reach NLRI IPv4 prefix: 10.0.1.0 <=====

```