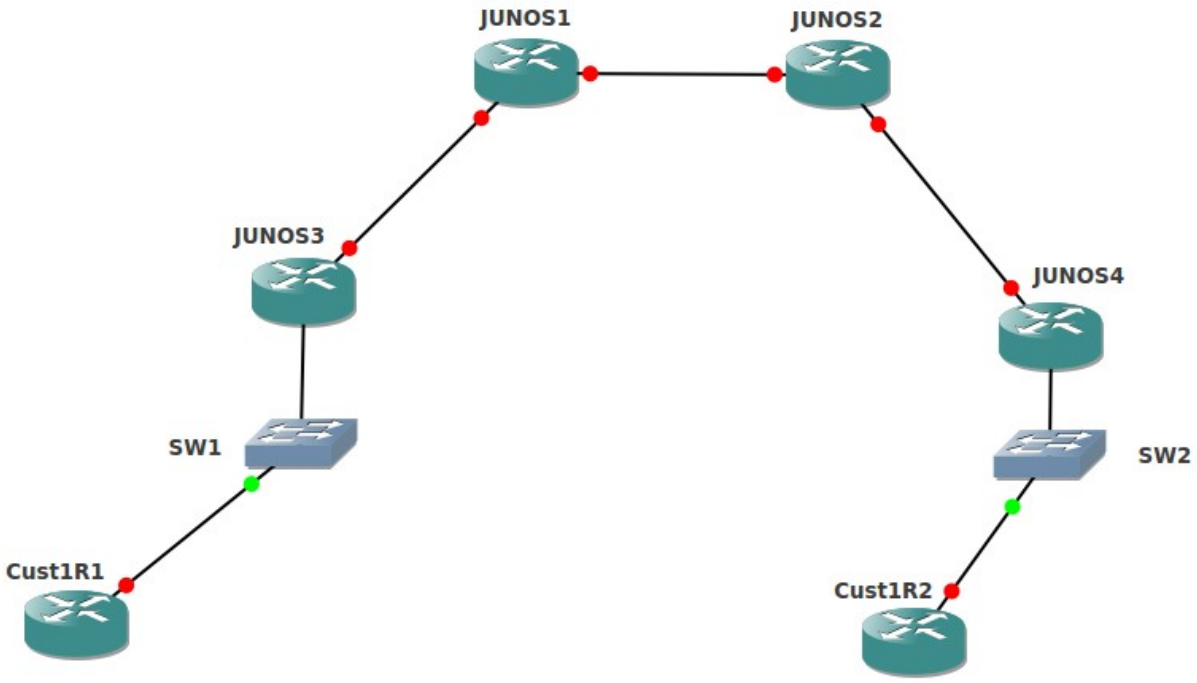
MPLS L3VPN



Junos 2 ha configurazione simile a Junos 1 (P router)
Junos 4 ha configurazione simile a Junos 3 (PE router)
[Junos 4 ha OSPF per PE-CE; Junos 3 usa rotte statiche]
Cust1R1 usa rotte statiche (only default), Cust1R2 usa OSPF

Vengono qui rappresentate solo le parti salienti

JUNOS1 :

```
interfaces {
    em0 {
        description "Double virtual link to JUNOS2"
        vlan-tagging;
        unit 0 {
            vlan-id 100;
            family inet {
                address 10.0.0.1/30;
            }
            family inet6 {
                address fec0:0:0:1002::1/64;
            }
            family mpls;
        }
        unit 101 {
            vlan-id 101;
            family inet {
                address 10.0.101.1/30;
            }
```

```
            family mpls;
        }
    }
    em1 {
        unit 0 {
            family inet {
                address 192.168.1.254/24;
            }
            family mpls;
        }
    }
    lo0 {
        description loopback;
        unit 0 {
            family inet {
                address 10.2.2.1/32;
            }
            family inet6 {
                address fec0:0:0:1006::1/128;
            }
        }
    }
}
protocols {
    mpls {
        traffic-engineering bgp-igp;
        interface em0.0;
        interface em0.101;
        interface em1.0;
    }
    ospf {
        area 0.0.0.0 {
            interface em0.0;
            interface em0.101;
            interface lo0.0 {
                passive;
            }
            interface em1.0;
        }
    }
    ldp {
        interface em0.0;
        interface em0.101;
        interface em1.0;
    }
}
```

JUNOS3:

```
interfaces {
    em0 {
        unit 0 {
            family inet {
                address 192.168.1.1/24;
```

```
            }
            family mpls;
        }
    }
    em1 {
        vlan-tagging;
        unit 11 {
            vlan-id 11;
            family inet {
                address 192.168.101.1/30;
            }
        }
    }
    lo0 {
        unit 0 {
            family inet {
                address 127.0.0.1/8;
                address 10.2.2.3/32;
            }
        }
    }
}
routing-options {
    route-distinguisher-id 10.2.2.3;
    autonomous-system 100;
}
protocols {
    mpls {
        traffic-engineering mpls-forwarding;
        interface em0.0;
    }
    bgp {
        group vpn {
            type internal;
            local-address 10.2.2.3;
            family inet-vpn {
                unicast;
            }
            neighbor 10.2.2.4;
        }
    }
    ospf {
        traffic-engineering;
        area 0.0.0.0 {
            interface em0.0;
            interface lo0.0 {
                passive;
            }
        }
    }
    ldp {
        interface em0.0;
    }
}
routing-instances {
```

```
    Cust1 {
        instance-type vrf;
        interface em1.11;
        route-distinguisher 100:8989;
        vrf-target target:100:2222;
        vrf-table-label;
        routing-options {
            static {
                route 192.168.1.0/24 next-hop 192.168.101.2;
            }
        }
    }
}
```

JUNOS4:

```
interfaces {
    em0 {
        unit 0 {
            family inet {
                address 192.168.2.1/24;
            }
            family mpls;
        }
    }
    em1 {
        vlan-tagging;
        unit 11 {
            vlan-id 11;
            family inet {
                address 192.168.102.1/30;
            }
        }
    }
    lo0 {
        unit 0 {
            family inet {
                address 127.0.0.1/8;
                address 10.2.2.4/32;
            }
        }
    }
}
routing-options {
    route-distinguisher-id 10.2.2.4;
    autonomous-system 100;
}
protocols {
    mpls {
        traffic-engineering mpls-forwarding;
        interface em0.0;
    }
    bgp {
        group vpn {
            type internal;
```

```
            local-address 10.2.2.4;
            family inet-vpn {
                unicast;
            }
            neighbor 10.2.2.3;
        }
    }
    ospf {
        traffic-engineering;
        area 0.0.0.0 {
            interface lo0.0 {
                passive;
            }
            interface em0.0;
        }
    }
    ldp {
        interface em0.0;
    }
}
policy-options {
    policy-statement bgp-to-ospf {
        from protocol bgp;
        then accept;
    }
}
routing-instances {
    Cust1 {
        instance-type vrf;
        interface em1.11;
        route-distinguisher 100:8989;
        vrf-target target:100:2222;
        vrf-table-label;
        protocols {
            ospf {
                export bgp-to-ospf;
                area 0.0.0.0 {
                    interface em1.11;
                }
            }
        }
    }
}
```

Cust1R1:

```
hostname Cust1R1
!
interface Loopback0
 ip address 192.168.1.254 255.255.255.255
!
interface FastEthernet0/0
 ip address 192.168.101.2 255.255.255.252
!
ip route 0.0.0.0 0.0.0.0 192.168.101.1
```

Cust1R2:

```
hostname Cust1R2
!
interface Loopback0
 ip address 192.168.2.254 255.255.255.255
!
interface FastEthernet0/0
 ip address 192.168.102.2 255.255.255.252
 ip mtu 1496
!
router ospf 1
 passive-interface Loopback0
 network 192.168.2.254 0.0.0.0 area 0
 network 192.168.102.0 0.0.0.3 area 0
```

Alcuni output:

```
Cust1R2#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

     192.168.102.0/30 is subnetted, 1 subnets
C       192.168.102.0 is directly connected, FastEthernet0/0
O E2 192.168.1.0/24 [110/0] via 192.168.102.1, 00:08:56, FastEthernet0/0
     192.168.2.0/32 is subnetted, 1 subnets
C       192.168.2.254 is directly connected, Loopback0
     192.168.101.0/30 is subnetted, 1 subnets
O E2    192.168.101.0 [110/0] via 192.168.102.1, 00:08:56, FastEthernet0/0


root@JUNOS3> show route table Cust1.inet.0

Cust1.inet.0: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.0/24     *[Static/5] 00:14:01
                      > to 192.168.101.2 via em1.11
192.168.2.254/32   *[BGP/170] 00:09:32, MED 2, localpref 100, from 10.2.2.4
                       AS path: I
                      > to 192.168.1.254 via em0.0, Push 16, Push 299808(top)
192.168.101.0/30   *[Direct/0] 00:14:01
                      > via em1.11
192.168.101.1/32   *[Local/0] 00:14:26
                       Local via em1.11
192.168.102.0/30   *[BGP/170] 00:13:19, localpref 100, from 10.2.2.4
                       AS path: I
                      > to 192.168.1.254 via em0.0, Push 16, Push 299808(top)
```

```
Cust1R2#ping 192.168.1.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.254, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/8 ms

Cust1R2#trace 192.168.1.254

Type escape sequence to abort.
Tracing the route to 192.168.1.254

  1 192.168.102.1 0 msec 0 msec 8 msec
  2  *  *  *
  3  *  *  *
  4 192.168.101.2 8 msec 4 msec *

root@JUNOS4> ping 192.168.1.254 routing-instance Cust1 count 2
PING 192.168.1.254 (192.168.1.254): 56 data bytes
64 bytes from 192.168.1.254: icmp_seq=0 ttl=255 time=4.044 ms
64 bytes from 192.168.1.254: icmp_seq=1 ttl=255 time=3.482 ms

--- 192.168.1.254 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/stddev = 3.482/3.763/4.044/0.281 ms
```

***** VARIANTE *****

BGP come protocollo CE-PE per Cust1R1
Cust1R1 AS = 65530

JUNOS3:

```
routing-instances {
    Cust1 {
        instance-type vrf;
        interface em1.11;
        route-distinguisher 100:8989;
        vrf-target target:100:2222;
        vrf-table-label;
        protocols {
            bgp {
                group Cust1R1 {
                    neighbor 192.168.101.2 {
                        family inet {
                            unicast;
                        }
                        peer-as 65530;
                    }
                }
            }
        }
    }
}
```

Cust1R1:

```
ip route 192.168.1.0 255.255.255.0 Null0
!
router bgp 65530
```

```
 no synchronization
 bgp log-neighbor-changes
 network 192.168.1.0
 neighbor 192.168.101.1 remote-as 100
 no auto-summary
```

Alcuni output:

```
Cust1R1#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

     192.168.102.0/30 is subnetted, 1 subnets
B       192.168.102.0 [20/0] via 192.168.101.1, 00:04:03
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
S       192.168.1.0/24 is directly connected, Null0
C       192.168.1.254/32 is directly connected, Loopback0
     192.168.2.0/32 is subnetted, 1 subnets
B       192.168.2.254 [20/0] via 192.168.101.1, 00:04:03
     192.168.101.0/30 is subnetted, 1 subnets
C       192.168.101.0 is directly connected, FastEthernet0/0
```

```
root@JUNOS3> show route table Cust1.inet.0

Cust1.inet.0: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

192.168.1.0/24     *[BGP/170] 00:05:12, MED 0, localpref 100
                       AS path: 65530 I
                     > to 192.168.101.2 via em1.11
192.168.2.254/32   *[BGP/170] 00:04:23, MED 2, localpref 100, from 10.2.2.4
                       AS path: I
                     > to 192.168.1.254 via em0.0, Push 16, Push 299808(top)
192.168.101.0/30   *[Direct/0] 00:05:24
                     > via em1.11
192.168.101.1/32   *[Local/0] 00:05:24
                       Local via em1.11
192.168.102.0/30   *[BGP/170] 00:04:23, localpref 100, from 10.2.2.4
                       AS path: I
                     > to 192.168.1.254 via em0.0, Push 16, Push 299808(top)
```