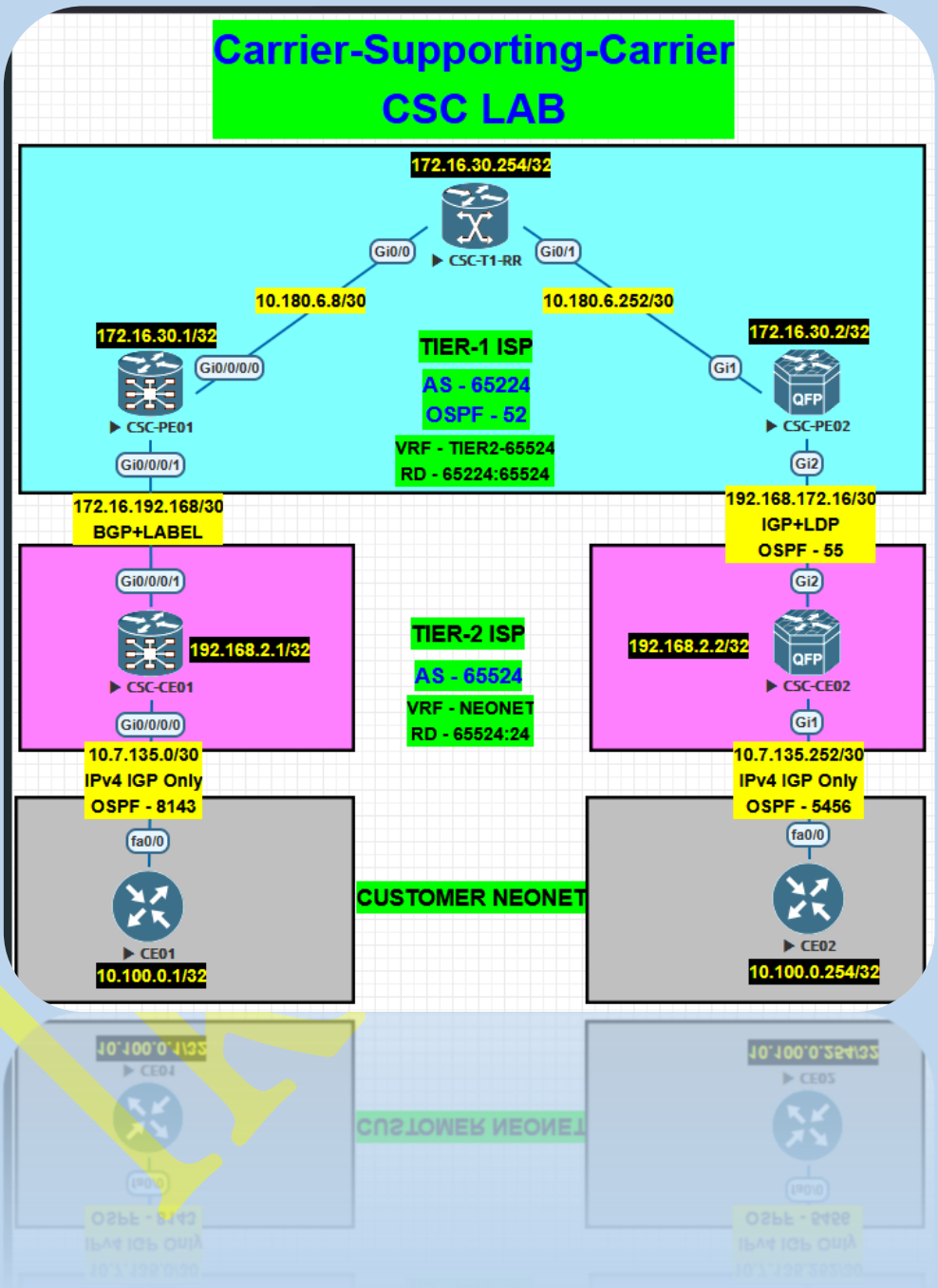
Carrier Supporting Carrier (CSC) Lab



Lab Requirements

1. Customer **NEONET** uses a **Tier–2 ISP** as transit to extend its enterprise network.
2. The **Tier–2 ISP** must support **MPLS L3VPN services** for customer **NEONET**.
3. The **Tier–2 ISP** uses a **Tier–1 ISP** as transit to extend its **MPLS transport network**.
4. The **Tier–1 ISP** must support **a fully labeled MPLS path** for the **Tier–2 ISP**.

TIER-1 ISP

IGP: OSPF Configuration

hello interval is 3s, dead interval is 10s and network type is point-to-point

- **CSC-PE01**

```
router ospf 52
 router-id 172.16.30.1
 network point-to-point
 passive enable
 dead-interval 10
 hello-interval 3
 auto-cost reference-bandwidth 10000
 area 0
  interface Loopback2028
  !
  interface GigabitEthernet0/0/0/0
   passive disable
  !
```

- **CSC-PE02**

```
router ospf 52
 router-id 172.16.30.2
 auto-cost reference-bandwidth 10000
 passive-interface default
```

```
 no passive-interface GigabitEthernet1
 network 10.180.6.253 0.0.0.0 area 0
 network 172.16.30.2 0.0.0.0 area 0
!
```

❖ **CSC-T1-RR**

```
router ospf 52
 router-id 172.16.30.254
 auto-cost reference-bandwidth 10000
 passive-interface default
 no passive-interface GigabitEthernet0/0
 no passive-interface GigabitEthernet0/1
 network 10.180.6.10 0.0.0.0 area 0
 network 10.180.6.254 0.0.0.0 area 0
 network 172.16.30.254 0.0.0.0 area 0
!
```

Configure MPLS in Respective Interfaces

```
!
```

BGP Configuration

❖ **CSC-PE01**

```
router bgp 65224
 bgp router-id 172.16.30.1
 address-family ipv4 unicast
```

```
!
address-family vpnv4 unicast
!
neighbor 172.16.30.254
 remote-as 65224
 password kolwin!!!!
 update-source Loopback2028
 address-family ipv4 unicast
 !
 address-family vpnv4 unicast
!
```

❖ **CSC-PE02**

```
router bgp 65224
 bgp router-id 172.16.30.2
 neighbor 172.16.30.254 remote-as 65224
 neighbor 172.16.30.254 password kolwin!!!!
 neighbor 172.16.30.254 update-source Loopback2028
 !
 address-family ipv4
  neighbor 172.16.30.254 activate
 exit-address-family
 !
```

address-family vpnv4

neighbor 172.16.30.254 activate

neighbor 172.16.30.254 send-community extended

exit-address-family

!

❖ CSC-T1-RR

router bgp 65224

bgp router-id 172.16.30.254

neighbor RR peer-group

neighbor RR remote-as 65224

neighbor RR password kolwin!!!!

neighbor RR update-source Loopback2028

neighbor 172.16.30.1 peer-group RR

neighbor 172.16.30.2 peer-group RR

!

address-family ipv4

neighbor RR route-reflector-client

neighbor 172.16.30.1 activate

neighbor 172.16.30.2 activate

exit-address-family

!

address-family vpnv4

```
 neighbor RR send-community extended
 neighbor RR route-reflector-client
 neighbor 172.16.30.1 activate
 neighbor 172.16.30.2 activate
exit-address-family
!
```

VRF Configuration

❖ **CSC-PE01**

```
vrf TIER2-65524
 address-family ipv4 unicast
  import route-target 65224:65524
  export route-target 65224:65524
  !
interface GigabitEthernet0/0/0/1
 vrf TIER2-65524
 ipv4 address 172.16.192.169 255.255.255.252
!
```

❖ **CSC-PE02**

```
ip vrf TIER2-65524
 rd 65224:65524
 route-target both 65224:65524
!
```

```
interface GigabitEthernet2
 ip vrf forwarding TIER2-65524
 ip address 192.168.172.17 255.255.255.252
!
```

CSC-PE & CSC-CE Routing

❖ **CSC-PE01**

```
mpls ldp
vrf TIER2-65524
  interface GigabitEthernet0/0/0/1
!
route-policy PASS
  pass
end-policy
!
router static
 vrf TIER2-65524
  address-family ipv4 unicast
   172.16.192.170/32 GigabitEthernet0/0/0/1
  !
router bgp 65224
vrf TIER2-65524
  rd 65224:65524
```

```
 address-family ipv4 unicast
  allocate-label all
 !
 neighbor 172.16.192.170
  remote-as 65524
  password kolwin!!!!
  address-family ipv4 unicast
   route-policy PASS in
   route-policy PASS out
  !
  address-family ipv4 labeled-unicast
   route-policy PASS in
   route-policy PASS out
  !
```

❖ **CSC-CE01**

```
mpls ldp
interface GigabitEthernet0/0/0/1
 !
router static
 address-family ipv4 unicast
  172.16.192.169/32 GigabitEthernet0/0/0/1
 !
```

```
router bgp 65524
 bgp router-id 192.168.2.1
 address-family ipv4 unicast
  network 192.168.2.1/32
  allocate-label all
 !
 address-family vpnv4 unicast
 !
neighbor 172.16.192.169
  remote-as 65224
  password kolwin!!!!
  address-family ipv4 unicast
   route-policy PASS in
   route-policy PASS out
  !
  address-family ipv4 labeled-unicast
   route-policy PASS in
   route-policy PASS out
!
```

❖ **CSC-PE02**

```
interface GigabitEthernet2
mpls ip
```

```
!
router ospf 55 vrf TIER2-65524
 router-id 192.168.172.17
 auto-cost reference-bandwidth 10000
 redistribute bgp 65224 subnets
 passive-interface default
 no passive-interface GigabitEthernet2
 network 192.168.172.17 0.0.0.0 area 0
!
router bgp 65224
address-family ipv4 vrf TIER2-65524
  redistribute ospf 55 match internal external 1 external 2
 exit-address-family
!
```

❖ CSC-CE02

```
interface GigabitEthernet2
mpls ip
!
router ospf 55
 router-id 192.168.2.2
 auto-cost reference-bandwidth 10000
 passive-interface default
```

no passive-interface GigabitEthernet2

network 192.168.2.2 0.0.0.0 area 0

network 192.168.172.18 0.0.0.0 area 0

!

TIER-2 ISP VPNv4 Peering

❖ **CSC-CE01**

router bgp 65524

neighbor 192.168.2.2

remote-as 65524

password kolwin!!!!

update-source Loopback2028

address-family vpnv4 unicast

!

❖ **CSC-CE02**

router bgp 65524

neighbor 192.168.2.1 remote-as 65524

neighbor 192.168.2.1 password kolwin!!!!

neighbor 192.168.2.1 update-source Loopback2028

!

address-family vpnv4

neighbor 192.168.2.1 activate

neighbor 192.168.2.1 send-community extended

exit-address-family

!

CSC-CE & CE Routing

❖ **CSC-CE01**

vrf **NEONET**

address-family ipv4 unicast

import route-target 65524:24

export route-target 65524:24

!

interface GigabitEthernet0/0/0/0

vrf **NEONET**

ipv4 address 10.7.135.1 255.255.255.252

!

router ospf **8143**

vrf **NEONET**

router-id 0.0.0.253

network point-to-point

passive enable

dead-interval 6

hello-interval 2

auto-cost reference-bandwidth 10000

redistribute bgp 65524

```
 area 0
  interface GigabitEthernet0/0/0/0
   passive disable
!
router bgp 65524
vrf NEONET
 rd 65524:24
 address-family ipv4 unicast
  redistribute ospf 8143 match internal external
!
```

❖ **CE01**

```
router ospf 8143
 router-id 10.100.0.1
 auto-cost reference-bandwidth 10000
 passive-interface default
 no passive-interface FastEthernet0/0
 network 10.7.135.2 0.0.0.0 area 0
 network 10.100.0.1 0.0.0.0 area 0
!
```

❖ **CSC-CE02**

```
ip vrf NEONET
 rd 65524:24
```

```
 route-target both 65524:24
!
interface GigabitEthernet1
 ip vrf forwarding NEONET
 ip address 10.7.135.253 255.255.255.252
!
router ospf 5456 vrf NEONET
 router-id 0.0.0.254
 auto-cost reference-bandwidth 10000
 redistribute bgp 65524 subnets
 passive-interface default
 no passive-interface GigabitEthernet1
 network 10.7.135.253 0.0.0.0 area 0
!
router bgp 65524
address-family ipv4 vrf NEONET
  redistribute ospf 5456 match internal external 1 external 2
 exit-address-family
!
```

❖ **CE02**

```
router ospf 5456
 router-id 10.100.0.254
```

auto-cost reference-bandwidth 10000

passive-interface default

no passive-interface FastEthernet0/0

network 10.7.135.254 0.0.0.0 area 0

network 10.100.0.254 0.0.0.0 area 0

!

Verification

TIER2-ISP

❖ **CSC-CE01**

show bgp vpnv4 unicast summary

```
Neighbor        Spk    AS MsgRcvd MsgSent   TblVer  InQ OutQ  Up/Down  St/PfxRcd
192.168.2.2       0 65524     230     211       15    0    0 03:23:29          2
```

show bgp vpnv4 unicast

```
Route Distinguisher: 65524:24 (default for vrf NEONET)
*> 10.7.135.0/30      0.0.0.0                  0         32768 ?
*>i10.7.135.252/30    192.168.2.2              0    100      0 ?
*> 10.100.0.1/32      10.7.135.2              11         32768 ?
*>i10.100.0.254/32    192.168.2.2             11    100      0 ?
```

traceroute 192.168.2.2 source loopback2028

```
1  172.16.192.169 [MPLS: Label 24006 Exp 0] 9 msec  0 msec  0 msec
2  10.180.6.10 [MPLS: Labels 16/20 Exp 0] 0 msec  0 msec  0 msec
3  192.168.172.17 [MPLS: Label 20 Exp 0] 0 msec  0 msec  0 msec
4  192.168.172.18 0 msec  *  0 msec
```

Fully labeled MPLS path

❖ **CSC-CE02**

show ip bgp vpnv4 all summary

```
Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
192.168.2.1     4        65524     214     234       14    0    0 03:26:55        2
```

show ip bgp vpnv4 all

```
Route Distinguisher: 65524:24 (default for vrf NEONET)
 *>i 10.7.135.0/30    192.168.2.1              0    100      0 ?
 *>  10.7.135.252/30  0.0.0.0                  0         32768 ?
 *>i 10.100.0.1/32    192.168.2.1             11    100      0 ?
 *>  10.100.0.254/32  10.7.135.254            11         32768 ?
```

traceroute 192.168.2.1 source loopback2028

```
1 192.168.172.17 [MPLS: Label 19 Exp 0] 11 msec 7 msec 7 msec
2 10.180.6.254 [MPLS: Labels 17/24005 Exp 0] 9 msec 19 msec 21 msec
3 10.180.6.9 [MPLS: Label 24005 Exp 0] 20 msec 17 msec 20 msec
4 172.16.192.170 26 msec *  8 msec
```

Fully labeled MPLS path

❖ **CE01**

show ip route ospf

```
O E2     10.7.135.252/30 [110/1] via 10.7.135.1, 02:12:30, FastEthernet0/0
O E2     10.100.0.254/32 [110/11] via 10.7.135.1, 02:12:25, FastEthernet0/0
```

ping 10.100.0.254 source loopback0 repeat 100

```
Type escape sequence to abort.
Sending 100, 100-byte ICMP Echos to 10.100.0.254, timeout is 2 seconds:
Packet sent with a source address of 10.100.0.1
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (100/100), round-trip min/avg/max = 32/67/124 ms
CE01#
```

❖ CE02

show ip route ospf

```
O E2     10.7.135.0/30 [110/1] via 10.7.135.253, 02:15:21, FastEthernet0/0
O E2     10.100.0.1/32 [110/11] via 10.7.135.253, 02:15:21, FastEthernet0/0
```

ping 10.100.0.1 source loopback0 repeat 100

```
Type escape sequence to abort.
Sending 100, 100-byte ICMP Echos to 10.100.0.1, timeout is 2 seconds:
Packet sent with a source address of 10.100.0.254
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (100/100), round-trip min/avg/max = 8/27/80 ms
CE02#
```

Ko Lwin (Network)

BONUS

Below is the complete BGP configuration

❖ CSC-PE01

```
router bgp 65224
 bgp router-id 172.16.30.1
 address-family ipv4 unicast
 !
 address-family vpnv4 unicast
 !
 neighbor 172.16.30.254
  remote-as 65224
  password kolwin!!!!
```

```
 update-source Loopback2028
 address-family ipv4 unicast
 !
 address-family vpnv4 unicast
!
vrf TIER2-65524
 rd 65224:65524
 address-family ipv4 unicast
  allocate-label all
 !
 neighbor 172.16.192.170
  remote-as 65524
  password kolwin!!!!
  address-family ipv4 unicast
   route-policy PASS in
   route-policy PASS out
  !
  address-family ipv4 labeled-unicast
   route-policy PASS in
   route-policy PASS out
  !
```

❖ **CSC-PE02**

```
router bgp 65224
 bgp router-id 172.16.30.2
 neighbor 172.16.30.254 remote-as 65224
 neighbor 172.16.30.254 password kolwin!!!!
 neighbor 172.16.30.254 update-source Loopback2028
 !
 address-family ipv4
  neighbor 172.16.30.254 activate
 exit-address-family
 !
 address-family vpnv4
  neighbor 172.16.30.254 activate
  neighbor 172.16.30.254 send-community extended
 exit-address-family
 !
 address-family ipv4 vrf TIER2-65524
  redistribute ospf 55 match internal external 1 external 2
 exit-address-family
!
```

❖ **CSC-CE01**

```
router bgp 65524
```

```
bgp router-id 192.168.2.1
address-family ipv4 unicast
 network 192.168.2.1/32
 allocate-label all
!
address-family vpnv4 unicast
!
neighbor 192.168.2.2
 remote-as 65524
 password kolwin!!!!
 update-source Loopback2028
 address-family vpnv4 unicast
!
neighbor 172.16.192.169
 remote-as 65224
 password kolwin!!!!
 address-family ipv4 unicast
  route-policy PASS in
  route-policy PASS out
 !
 address-family ipv4 labeled-unicast
  route-policy PASS in
```

```
  route-policy PASS out
!
 vrf NEONET
  rd 65524:24
  address-family ipv4 unicast
   redistribute ospf 8143 match internal external
  !
```

❖ **CSC-CE02**

```
router bgp 65524
 bgp router-id 192.168.2.2
 neighbor 192.168.2.1 remote-as 65524
 neighbor 192.168.2.1 password kolwin!!!!
 neighbor 192.168.2.1 update-source Loopback2028
 !
 address-family vpnv4
  neighbor 192.168.2.1 activate
  neighbor 192.168.2.1 send-community extended
 exit-address-family
 !
 address-family ipv4 vrf NEONET
  redistribute ospf 5456 match internal external 1 external 2
 exit-address-family
```