

MPLS Backbone (PE and P) Configurations

<pre> PE1 mpls label range 1100 1199 mpls ldp router-id Loopback0 force ! interface Loopback0 ip address 1.1.1.11 255.255.255.255 ip ospf 1 area 0 ! interface Ethernet0/0 ip address 10.0.11.11 255.255.255.0 ip ospf 1 area 0 mpls ip </pre>	<pre> PE2 mpls label range 2200 2299 mpls ldp router-id Loopback0 force ! interface Loopback0 ip address 1.1.1.22 255.255.255.255 ip ospf 1 area 0 ! interface Ethernet0/0 ip address 10.0.22.22 255.255.255.0 ip ospf 1 area 0 mpls ip ! </pre>	<pre> PE3 mpls label range 3300 3399 mpls ldp router-id Loopback0 force ! interface Loopback0 ip address 1.1.1.33 255.255.255.255 ip ospf 1 area 0 ! interface Ethernet0/0 ip address 10.0.23.23 255.255.255.0 ip ospf 1 area 0 mpls ip </pre>
<pre> P1 mpls label range 100 199 mpls ldp router-id Loopback0 force ! interface Loopback0 ip address 1.1.1.1 255.255.255.255 ip ospf 1 area 0 ! interface Ethernet0/1 ip address 10.0.11.1 255.255.255.0 ip ospf 1 area 0 mpls ip ! interface Ethernet0/2 ip address 10.0.12.1 255.255.255.0 ip ospf 1 area 0 mpls ip </pre>	<pre> P2 mpls label range 200 299 mpls ldp router-id Loopback0 force ! interface Loopback0 ip address 1.1.1.2 255.255.255.255 ip ospf 1 area 0 ! interface Ethernet0/1 ip address 10.0.12.2 255.255.255.0 ip ospf 1 area 0 mpls ip ! interface Ethernet0/2 ip address 10.0.22.2 255.255.255.0 ip ospf 1 area 0 mpls ip ! interface Ethernet0/3 ip address 10.0.23.2 255.255.255.0 ip ospf 1 area 0 mpls ip </pre>	

PE / PE Configurations for MultiProtocol Enabled BGP

<pre> PE1 router bgp 99 !for tcp connection only bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 1.1.1.22 remote-as 99 neighbor 1.1.1.22 update-source Loopback0 neighbor 1.1.1.33 remote-as 99 neighbor 1.1.1.33 update-source Loopback0 ! lit enables bgp ipv4 unicast capability address-family ipv4 neighbor 1.1.1.22 activate neighbor 1.1.1.22 next-hop-self neighbor 1.1.1.33 activate neighbor 1.1.1.33 next-hop-self exit-address-family ! lit enables bgp vpv4 unicast capability address-family vpv4 neighbor 1.1.1.22 activate neighbor 1.1.1.22 send-community both neighbor 1.1.1.33 activate neighbor 1.1.1.33 send-community both exit-address-family ! </pre>	<pre> PE2 router bgp 99 !for tcp connection only bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 1.1.1.11 remote-as 99 neighbor 1.1.1.11 update-source Loopback0 neighbor 1.1.1.33 remote-as 99 neighbor 1.1.1.33 update-source Loopback0 ! lit enables bgp ipv4 unicast capability address-family ipv4 neighbor 1.1.1.11 activate neighbor 1.1.1.11 next-hop-self neighbor 1.1.1.33 activate neighbor 1.1.1.33 next-hop-self exit-address-family ! lit enables bgp vpv4 unicast capability address-family vpv4 neighbor 1.1.1.11 activate neighbor 1.1.1.11 send-community both neighbor 1.1.1.33 activate neighbor 1.1.1.33 send-community both exit-address-family ! </pre>	<pre> PE3 router bgp 99 !for tcp connection only bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 1.1.1.11 remote-as 99 neighbor 1.1.1.11 update-source Loopback0 neighbor 1.1.1.22 remote-as 99 neighbor 1.1.1.22 update-source Loopback0 ! lit enables bgp ipv4 unicast capability address-family ipv4 neighbor 1.1.1.11 activate neighbor 1.1.1.11 next-hop-self neighbor 1.1.1.22 activate neighbor 1.1.1.22 next-hop-self exit-address-family ! lit enables bgp vpv4 unicast capability address-family vpv4 neighbor 1.1.1.11 activate neighbor 1.1.1.11 send-community both neighbor 1.1.1.22 activate neighbor 1.1.1.22 send-community both exit-address-family ! </pre>
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VRF Export - Import Table

VRF	Route Distinguisher	Route-Target Export	Route-Target Import
CEA1	1.1.1.11:1	99:1	99:1
CEA2	1.1.1.22:1	99:1	99:1
CEA3	1.1.1.33:1	99:1	99:1
CEB1	1.1.1.11:2	99:2	99:2
CEB2	1.1.1.22:1	99:2	99:2
CEC1	1.1.1.11:3	99:3	99:3
CEC2	1.1.1.33:3	99:3	99:3

CE / PE Configurations

PE advertises redistributed routes to other PE

<pre>CEA1 interface Loopback0 ip address 192.168.11.1 255.255.255.0 ip ospf 1 area 1 ! interface Loopback1 ip address 192.168.12.1 255.255.255.0 ! interface Serial1/0 ip address 10.0.11.2 255.255.255.0 ip ospf 1 area 1 ! router ospf 1 redistribute connected subnets</pre>	<pre>PE1 (VRF) ip vrf CEA1 rd 1.1.1.11:1 route-target export 99:1 route-target import 99:1 ! interface Serial1/1 ip vrf forwarding CEA1 ip address 10.0.11.1 255.255.255.0 ! router ospf 11 vrf CEA1 domain-id 0.0.0.1 redistribute bgp 99 subnets network 10.0.11.1 0.0.0.0 area 1</pre>	<p>ps. If you dont type match external, internal or nssa, these prefixes does not reach to other customer sites.</p> <pre>router bgp 99 address-family ipv4 vrf CEA1 network 123.0.0.1 mask 255.255.255.255 redistribute ospf 11 match internal external 1 external 2 exit-address-famil y</pre>	<p>ps. If atother PEs specfy route-target import 99:1 value, related routes will be enter into vrf.</p>
<pre>CEB1 interface Loopback0 ip address 192.168.11.1 255.255.255.0 ! interface Loopback1 ip address 192.168.12.1 255.255.255.0 ! interface Serial1/0 ip address 10.0.11.2 255.255.255.0 ! router bgp 12 network 192.168.11.0 redistribute connected</pre>	<pre>PE1 (VRF) ip vrf CEB1 rd 1.1.1.11:2 route-target export 99:2 route-target import 99:2 ! interface Serial1/0 ip vrf forwarding CEB1 ip address 10.0.11.1 255.255.255.0 ! router bgp 99 no bgp default ipv4-unicast ! address-family ipv4 vrf CEB1 neighbor 10.0.11.2</pre>	<p>ps. If prefix comes from eBGP peer automatically advertise to other PE. Because it uses iBGP. But CE sides AS number is same, therefore we need as-override command</p> <pre>router bgp 99 address-family ipv4 vrf CEB1</pre>	<p>ps. If atother PEs specfy route-target import 99:2 value, related routes will be enter into vrf.</p>

<pre>neighbor 10.0.11.1 remote-as 99</pre>	<pre>remote-as 12 neighbor 10.0.11.2 activate exit-address-famil y</pre>	<pre>neighbor 10.0.11.2 as-override</pre>	
<pre>CEC1 interface Loopback0 ip address 192.168.11.1 255.255.255.0 ! interface Loopback1 ip address 192.168.12.1 255.255.255.0 ! interface Serial1/0 ip address 10.0.11.2 255.255.255.0 ! router eigrp 12 network 10.0.11.2 0.0.0.0 network 192.168.11.1 0.0.0.0 redistribute connected metric 1 1 1 1 1</pre>	<pre>PE1 (VRF) ip vrf CEC1 rd 1.1.1.11:3 route-target export 99:3 route-target import 99:3 ! interface Serial1/2 ip vrf forwarding CEC1 ip address 10.0.11.1 255.255.255.0 ! router eigrp 99 ! address-family ipv4 vrf CEC1 autonomous-syst em 12 redistribute bgp 99 metric 1 1 1 1 network 10.0.11.1 0.0.0.0 exit-address-famil y</pre>	<pre>router bgp 99 address-family ipv4 vrf CEC1 redistribute eigrp 12 exit-address-famil y</pre>	<pre>ps. If atother PEs specfy route-target import 99:3 value, related routes will be enter into vrf.</pre>
<pre>CEA2 interface Loopback0 ip address 192.168.21.1 255.255.255.0 ip ospf 1 area 0 ! interface Loopback1 ip address 192.168.22.1 255.255.255.0 ! interface</pre>	<pre>PE2 (VRF) ip vrf CEA2 rd 1.1.1.22:1 route-target export 99:1 route-target import 99:1 ! interface Serial1/1 ip vrf forwarding CEA2 ip address 10.0.22.1 255.255.255.0 !</pre>	<pre>address-family ipv4 vrf CEA2 network 123.0.0.2 mask 255.255.255.255 redistribute ospf 22 match internal external 1 external 2 exit-address-famil y</pre>	

<pre> Ethernet0/0 ip address 10.0.23.2 255.255.255.0 ip ospf 1 area 0 ip ospf cost 1000 ! interface Serial1/0 ip address 10.0.22.2 255.255.255.0 ip ospf 1 area 0 ! router ospf 1 redistribute connected subnets </pre>	<pre> router ospf 22 vrf CEA2 domain-id 0.0.0.1 area 0 sham-link 123.0.0.2 123.0.0.3 redistribute bgp 99 subnets network 10.0.22.1 0.0.0.0 area 0 </pre>		
<pre> CEB2 interface Loopback0 ip address 192.168.21.1 255.255.255.0 ! interface Loopback1 ip address 192.168.22.1 255.255.255.0 ! interface Serial1/0 ip address 10.0.22.2 255.255.255.0 ! router bgp 12 network 192.168.21.0 redistribute connected neighbor 10.0.22.1 remote-as 99 </pre>	<pre> PE2 (VRF) ip vrf CEB2 rd 1.1.1.22:2 route-target export 99:2 route-target import 99:2 ! interface Serial1/0 ip vrf forwarding CEB2 ip address 10.0.22.1 255.255.255.0 ! address-family ipv4 vrf CEB2 neighbor 10.0.22.2 remote-as 12 neighbor 10.0.22.2 activate exit-address-famil y </pre>	<pre> router bgp 99 address-family ipv4 vrf CEB1 neighbor 10.0.11.2 as-override </pre>	
<pre> CEA3 interface Loopback0 ip address 192.168.31.1 255.255.255.0 ip ospf 1 area 0 ! </pre>	<pre> PE3 (VRF) ip vrf CEA3 rd 1.1.1.33:1 route-target export 99:1 route-target import 99:1 ! </pre>	<pre> router bgp 99 address-family ipv4 vrf CEA3 network 123.0.0.3 mask 255.255.255.255 redistribute ospf 33 match internal </pre>	

<pre>interface Loopback1 ip address 192.168.32.1 255.255.255.0 ! interface Ethernet0/0 ip address 10.0.23.3 255.255.255.0 ip ospf 1 area 0 ip ospf cost 1000 ! interface Serial1/0 ip address 10.0.33.2 255.255.255.0 ip ospf 1 area 0 ! router ospf 1 redistribute connected subnets</pre>	<pre>interface Serial1/0 ip vrf forwarding CEA3 ip address 10.0.33.1 255.255.255.0 ! router ospf 33 vrf CEA3 domain-id 0.0.0.1 area 0 sham-link 123.0.0.3 123.0.0.2 redistribute bgp 99 subnets network 10.0.33.1 0.0.0.0 area 0</pre>	<pre>external 1 external 2 exit-address-famil y</pre>	
<pre>CEC2 interface Loopback0 ip address 192.168.31.1 255.255.255.0 ! interface Loopback1 ip address 192.168.32.1 255.255.255.0 ! interface Serial1/0 ip address 10.0.33.2 255.255.255.0 ! router eigrp 12 network 10.0.33.2 0.0.0.0 network 192.168.31.1 0.0.0.0 redistribute connected metric 1 1 1 1 1</pre>	<pre>PE3 (VRF) ip vrf CEC2 rd 1.1.1.33:3 route-target export 99:3 route-target import 99:3 ! interface Serial1/1 ip vrf forwarding CEC2 ip address 10.0.33.1 255.255.255.0 ! router eigrp 99 ! address-family ipv4 vrf CEC2 autonomous-syst em 12 redistribute bgp 99 metric 1 1 1 1 1 network 10.0.33.1 0.0.0.0</pre>	<pre>router bgp 99 address-family ipv4 vrf CEC2 redistribute eigrp 12 exit-address-famil y</pre>	

	exit-address-family		
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v1. CEA1 - CEA2 - CEA3 — OSPF Domain-id is not same (Problem is IA routes does not come as expected. It comes O E, because PE redistributed into ospf from BGP)

PE1 router ospf 11 vrf CEA1 domain-id 0.0.0.1	PE2 router ospf 22 vrf CEA2 domain-id 0.0.0.1	PE3 router ospf 33 vrf CEA3 domain-id 0.0.0.1
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v2. CEA1 - CEA2 - CEA3 — OSPF External Routes (Problem is O E1 or O E2 does not installed which is injected other sites)

PE1 router bgp 99 address-family ipv4 vrf CEA1 redistribute ospf 11 match internal external 1 external 2	PE2 router bgp 99 address-family ipv4 vrf CEA2 redistribute ospf 22 match internal external 1 external 2	PE3 router bgp 99 address-family ipv4 vrf CEA3 redistribute ospf 33 match internal external 1 external 2
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v3. v2. CEA2 - CEA3 — OSPF Backdoor (If we want use MPLS backbone as a primary path ??) O > IA
 Resolution = Sham Link

<pre>CEA2 interface ethernet 0/0 ip ospf cost 200 CEA3 interface ethernet 0/0 ip ospf cost 200</pre>	<pre>PE2 interface Loopback123 description ShamLink ip vrf forwarding CEA2 ip address 123.0.0.2 255.255.255.255 ! router bgp 99 address-family ipv4 vrf CEA2 network 123.0.0.2 mask 255.255.255.255 ! router ospf 22 vrf CEA2 area 0 sham-link 123.0.0.2 123.0.0.3</pre>	<pre>PE3 interface Loopback123 description ShamLink ip vrf forwarding CEA3 ip address 123.0.0.3 255.255.255.255 ! router bgp 99 address-family ipv4 vrf CEA3 network 123.0.0.3 mask 255.255.255.255 ! router ospf 22 vrf CEA3 area 0 sham-link 123.0.0.3 123.0.0.2</pre>
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MPLS Label Filtering

<pre>PE1, P1, P2, PE2, PE3 no mpls ldp advertise-labels ! access-list 1 deny 10.0.11.0 0.0.0.255 access-list 1 deny 10.0.12.0 0.0.0.255 access-list 1 deny 10.0.22.0 0.0.0.255 access-list 1 deny 10.0.23.0 0.0.0.255 access-list 1 permit any ! mpls ldp advertise-labels for 1</pre>
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MP-BGP Prefix Filtering with import-map export-map

You have to at the following link

<http://rekrowten.wordpress.com/2012/09/24/route-leak-between-vrfs-with-import-map-s-and-export-maps/>

<pre>CEC1 interface loopback 2 ip address 172.16.11.1 255.255.255.0 ! interface loopback 3 ip address 172.16.12.1 255.255.255.0 PE1 ip prefix-list PL-1 seq 10 permit 172.16.11.0/24 ! route-map CEC-2-EXPORT permit 10 match ip address prefix-list PL-1 set extcommunity rt 99:666 ! route-map CEC-2-EXPORT permit 20 set extcommunity rt 99:3 ! ip vrf CEC1 rd 1.1.1.11:3 export map CEC-2-EXPORT route-target export 99:3 route-target import 99:3</pre>	<pre>PE2 ip vrf CEC2 route-target import 99:666</pre>
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