

Routing
Switching
Tigers
Forum



MPLS

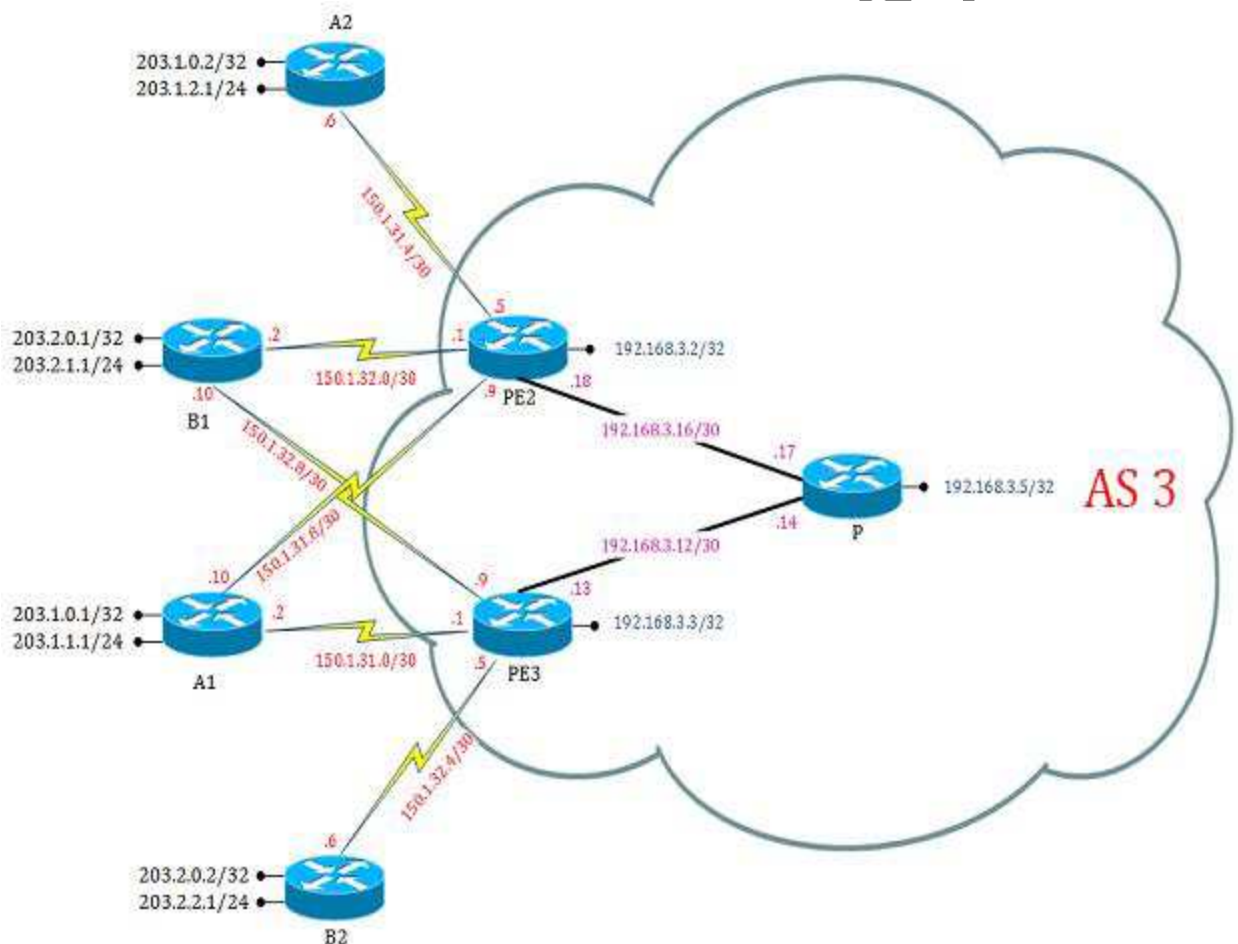


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IOS used: c7200-p-mz.120-32.S.bin



Task 1: BASIC OSPF and MPLS setup

Configure OSPF and MPLS on all PE-routers and P-router

Step 1. Configure following on respective P and PE routers:

PE2 Router Initial Config:

```
hostname PE2
!
ip cef
mpls label protocol ldp
no tag-switching ip propagate-ttl
!
interface Loopback0
ip address 192.168.3.2 255.255.255.255
!
interface FastEthernet1/0
description **link_to_P**
ip address 192.168.3.18 255.255.255.252
tag-switching ip
no shutdown
!
interface Serial2/0
description **link_to_A2**
ip address 150.1.31.5 255.255.255.252
no shutdown
!
interface Serial2/1
description **link_to_B1**
ip address 150.1.32.1 255.255.255.252
no shutdown
!
interface Serial2/2
description **link_to_A1**
ip address 150.1.31.9 255.255.255.252
no shutdown
!
```

PE3 Router Initial Config:

```
hostname PE3
!
ip cef
mpls label protocol ldp
no tag-switching ip propagate-ttl
!
interface Loopback0
ip address 192.168.3.3 255.255.255.255
!
interface FastEthernet0/0
description **link_to_P**
ip address 192.168.3.13 255.255.255.252
tag-switching ip
no shutdown
!
interface Serial2/0
description **link_to_B1**
ip address 150.1.32.9 255.255.255.252
no shutdown
!
interface Serial2/1
description **link_to_A1**
ip address 150.1.31.1 255.255.255.252
no shutdown
!
interface Serial2/2
description **link_to_B2**
ip address 150.1.32.5 255.255.255.252
no shutdown
!
```

```
router ospf 64
log-adjacency-changes
network 192.168.0.0 0.0.255.255 area 0
!
end
```

```
router ospf 64
log-adjacency-changes
network 192.168.0.0 0.0.255.255 area 0
!
end
```

P Router Config:

```
hostname P
!
ip cef
mpls label protocol ldp
no tag-switching ip propagate-ttl
!
interface Loopback0
ip address 192.168.3.5 255.255.255.255
!
interface FastEthernet0/0
description **link_to_PE3**
ip address 192.168.3.14 255.255.255.252
tag-switching ip
no shutdown
!
interface FastEthernet1/0
description **link_to_PE2**
ip address 192.168.3.17 255.255.255.252
tag-switching ip
no shutdown
!
router ospf 64
log-adjacency-changes
network 192.168.0.0 0.0.255.255 area 0
!
end
```

A2 Router Initial Config:

```
hostname A2
!  
interface Loopback0  
ip address 203.1.0.2 255.255.255.255  
!  
interface Loopback1  
ip address 203.1.2.1 255.255.255.0  
!  
interface Serial2/0  
ip address 150.1.31.6 255.255.255.252  
clock rate 64000  
no shutdown  
!  
end
```

B1 Router Initial Config:

```
hostname B1
!  
interface Loopback0  
ip address 203.2.0.1 255.255.255.255  
!  
interface Loopback1  
ip address 203.2.1.1 255.255.255.0  
!  
interface Serial2/0  
ip address 150.1.32.10 255.255.255.252  
clock rate 64000  
no shutdown  
!  
interface Serial2/1  
ip address 150.1.32.2 255.255.255.252  
clock rate 64000  
no shutdown  
!  
end
```

A1 Router Initial Config:

```
hostname A1
!  
interface Loopback0  
ip address 203.1.1.1 255.255.255.0  
!  
interface Loopback1  
ip address 203.1.0.1 255.255.255.255  
!  
interface Serial2/1  
ip address 150.1.31.2 255.255.255.252  
clock rate 64000  
no shutdown  
!
```

B2 Router Initial Config:

```
hostname B2
!  
interface Loopback0  
ip address 203.2.0.2 255.255.255.255  
!  
interface Loopback1  
ip address 203.2.2.1 255.255.255.0  
!  
interface Serial2/2  
ip address 150.1.32.6 255.255.255.252  
clock rate 64000  
no shutdown
```

```
interface Serial2/2
ip address 150.1.31.10 255.255.255.252
clock rate 64000
no shutdown
!
end
```

```
!
end
```

Task 2: Configure Multi-protocol BGP Configure multi-protocol BGP between provider-edge (PE) routers.

Step 1 Enable BGP sessions on all PE routers in your Service Provider backbone.

Step 2 Activate VPNv4 BGP sessions between all PE routers in your Service Provider backbone.

Configure the following on PE2 router:

PE2(config)#

```
router bgp 3
 neighbor 192.168.3.3 remote-as 3
 neighbor 192.168.3.3 update-source Loopback0
 !
 address-family ipv4
 no auto-summary
 no synchronization
 neighbor 192.168.3.3 activate
 network 192.168.3.2 mask 255.255.255.255
 exit-address-family
 !
 address-family vpnv4
 neighbor 192.168.3.3 activate
 neighbor 192.168.3.3 send-community extended
 exit-address-family
```

Configure following on PE3 router:

PE3(config)#

```
router bgp 3
  bgp log-neighbor-changes
  neighbor 192.168.3.2 remote-as 3
  neighbor 192.168.3.2 update-source Loopback0
  !
  address-family ipv4
  no auto-summary
  no synchronization
  neighbor 192.168.3.2 activate
  network 192.168.3.3 mask 255.255.255.255
  exit-address-family
  !
  address-family vpnv4
  neighbor 192.168.3.2 activate
  neighbor 192.168.3.2 send-community extended
  exit-address-family
```

Task 3: Design your VPN Solution Create the virtual private network (VRF) on provider

edge (PE2):**PE2(config)#**

```
ip vrf a
  rd 3:1
  route-target both 3:1
  !
ip vrf a_central
  rd 3:11
  route-target both 3:1
  route-target both 3:30
  !
ip vrf b_central
  rd 3:21
  route-target both 3:2
  route-target both 3:30
```

Create the virtual private network (VRF) on provider edge (PE3):

PE3(config)#

```
ip vrf a_central
  rd 3:11
  route-target both 3:1
  route-target both 3:30
!
ip vrf b
  rd 3:2
  route-target both 3:2
!
ip vrf b_central
  rd 3:21
  route-target both 3:2
  route-target both 3:30
```

Task 4: Create VRFs for A2, B1, A1 and B2 Attach the provider edge-to-customer edge

(PE-CE) link to the newly created VRFs with the following commands on PE2:**PE2(config)#**

```
interface Serial2/0
  ip vrf forwarding a
  ip address 150.1.31.5 255.255.255.252
!
interface Serial2/1
  ip vrf forwarding b_central
  ip address 150.1.32.1 255.255.255.252
!
interface Serial2/2
  ip vrf forwarding a_central
  ip address 150.1.31.9 255.255.255.252
```

Note: "ip vrf forwarding name" command removes the IP address from interface, so IP address need to be re-configured.

Attach the PE-CE link to the newly created VRFs with the following commands on PE3:

PE3(config)#

```
interface Serial2/0
 ip vrf forwarding b_central
 ip address 150.1.32.9 255.255.255.252
!
interface Serial2/1
 ip vrf forwarding a_central
 ip address 150.1.31.1 255.255.255.252
!
interface Serial2/2
 ip vrf forwarding b
 ip address 150.1.32.5 255.255.255.252
```

Task 5: Configure BGP on A1, B1 and A2, B2

The following commands need to be entered on the A1 router:

A1(config)#

```
router bgp 2
 neighbor 150.1.31.1 remote-as 3
 neighbor 150.1.31.1 allowas-in
 neighbor 150.1.31.9 remote-as 3
 neighbor 150.1.31.9 allowas-in
 redistribute connected
```

The following commands need to be entered on the B1 router:

B1(config)#

```
router bgp 4
 neighbor 150.1.32.1 remote-as 3
 neighbor 150.1.32.1 allowas-in
 neighbor 150.1.32.9 remote-as 3
 neighbor 150.1.32.9 allowas-in
 redistribute connected
```

The following commands need to be entered on the A2 router:

```
A2(config)#  
router bgp 2  
neighbor 150.1.31.5 remote-as 3  
neighbor 150.1.31.5 allowas-in  
redistribute connected
```

The following commands need to be entered on the B2 router:

```
B2(config)#  
router bgp 4  
neighbor 150.1.32.5 remote-as 3  
neighbor 150.1.32.5 allowas-in  
redistribute connected
```

Task 6: Configure New VRFs For A1 and B1/Re-establish BGP Routing

The following commands need to be entered on PE2:

```
PE2(config)#  
router bgp 3  
address-family ipv4 vrf b_central  
neighbor 150.1.32.2 remote-as 4  
neighbor 150.1.32.2 activate  
neighbor 150.1.32.2 as-override  
exit  
address-family ipv4 vrf a_central  
neighbor 150.1.31.10 remote-as 2  
neighbor 150.1.31.10 activate  
neighbor 150.1.31.10 as-override  
exit  
address-family ipv4 vrf a  
neighbor 150.1.31.6 remote-as 2  
neighbor 150.1.31.6 activate  
neighbor 150.1.31.6 as-override
```

```
exit
```

The following commands need to be entered on PE3:

```
PE3(config)#
```

```
router bgp 3
address-family ipv4 vrf b_central
neighbor 150.1.32.10 remote-as 4
neighbor 150.1.32.10 activate
neighbor 150.1.32.10 as-override
exit
address-family ipv4 vrf b
neighbor 150.1.32.6 remote-as 4
neighbor 150.1.32.6 activate
neighbor 150.1.32.6 as-override
exit
address-family ipv4 vrf a_central
neighbor 150.1.31.2 remote-as 2
neighbor 150.1.31.2 activate
neighbor 150.1.31.2 as-override
exit
```

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