

ring VPN MPLS over ATM with Cisco 7500 Routers and LightSt

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Configuring VPN MPLS over ATM with Cisco 7500 Routers and LightStream 1010 Switches

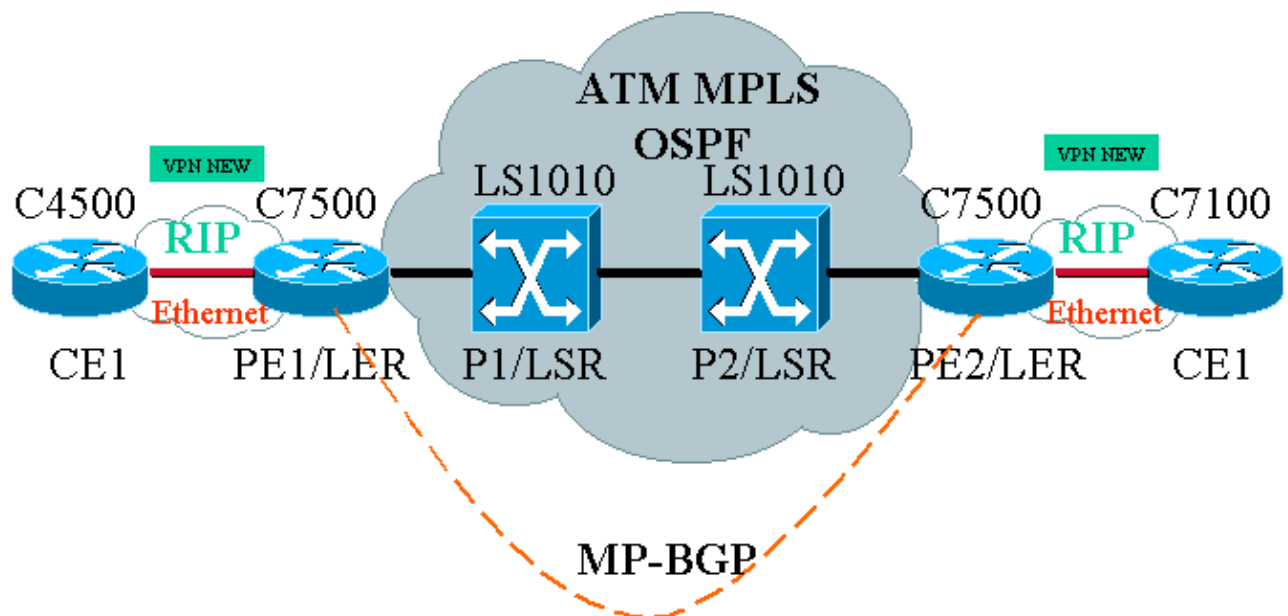
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Introduction

This document shows how to configure Virtual Private Network (VPN) Multiprotocol Label Switching (MPLS) over ATM using Cisco 7500 routers as Label Edge Routers (LERs) and LightStream 1010 switches as Label Switch Routers (LSRs). Two ethernet-connected routers, each on a remote customer site, are part of a VPN. In this document, we look at the end-to-end device configurations and helpful show commands.

Network Diagram

The setup we are using here is as follows:



Network Description

Our current setup contains the following elements. In VPN terminology, these are:

- CE = Customer Edge Router
- PE = Provider Edge Router
- P=Provider Router

In MPLS terminology, these are:

- LER = Label Edge Router
- LSR = Label Switch Router
- TDP/LDP = Tag Distribution Protocol/Label Distribution Protocol

We have configured our setup as follows:

- PE1 and PE2 are the LERs in our ATM network.
- P1 and P2 are the LSRs.
- CE1 and CE2 are Customer Edge Routers that are unaware and, hence, do not carry out VPN or MPLS.
- CE1 and CE2 are ethernet connected to PE1 and PE2 respectively, and carry out Routing Information Protocol (RIP).
- PE1, PE2, P1 and P2 are doing Open Shortest Path First (OSPF) and are all in Area 0. OSPF is the Interior Gateway Protocol (IGP) used in the ATM network. We are using tag-switching on the ATM interfaces on all four ATM devices. Tag Distribution Protocol (TDP) assigns Tags to the OSPF routes.
- PE1 and PE2 are Multiprotocol-Border Gateway Protocol (MP-BGP) peers.
- RIP routes are redistributed into MP-BGP. MP-BGP routes redistributed into RIP on PE1 and PE2 routers.
- Our setup maintains separate VRF routing tables in the PE1 and PE2 routers.
- The name of the VPN we are using in this example is NEW.

Configurations

| CE1 |
|--|
| <pre>! version 12.1 service timestamps debug datetime msec service timestamps log datetime msec ! boot system flash c4500-js-mz.121-5 ! ip subnet-zero ! interface Loopback0 ip address 10.1.1.1 255.255.255.0 ! interface Loopback1 ip address 10.2.2.2 255.255.255.0 ! interface Loopback2 ip address 10.3.3.3 255.255.255.0 ! interface Ethernet0 ip address 100.1.1.2 255.255.255.0 media-type 10BaseT ! router rip version 2</pre> |

```
network 10.0.0.0
network 100.0.0.0
no auto-summary
!
ip classless
!
```

PE1

```
!
version 12.1

service timestamps debug uptime
service timestamps log uptime

!
boot system flash slot1:rsp-jsv-mz.121-5a.bin
!

ip subnet-zero

!
ip vrf NEW
 rd 200:1
  route-target export 200:1
  route-target import 200:1
ip cef distributed

!
interface Loopback0
 ip address 1.1.1.1 255.255.255.255
!
interface ATM2/0/0
 mtu 1500
 no ip address
!
interface ATM2/0/0.10 tag-switching
 ip unnumbered Loopback0
 tag-switching ip
!
interface Ethernet2/1/0
 ip vrf forwarding NEW
 ip address 100.1.1.1 255.255.255.0

!
router ospf 100
 no log-adjacency-changes
 network 1.0.0.0 0.255.255.255 area 0
 network 100.1.1.0 0.0.0.255 area 0
!
router rip
 version 2
 network 100.0.0.0
 no auto-summary
!
 address-family ipv4 vrf NEW
 version 2
 redistribute bgp 200 metric 0
 network 100.0.0.0
 no auto-summary
 exit-address-family
!
router bgp 200
```

```

bgp log-neighbor-changes
neighbor 2.2.2.2 remote-as 200

neighbor 2.2.2.2 update-source Loopback0
no auto-summary
!
address-family ipv4 vrf NEW
redistribute rip
no auto-summary
no synchronization
exit-address-family
!
address-family vpnv4
neighbor 2.2.2.2 activate
neighbor 2.2.2.2 send-community extended
no auto-summary
exit-address-family
!
ip classless
!

```

P1

```

!
service timestamps debug uptime
service timestamps log uptime
!
ip subnet-zero
!
interface Loopback0
 ip address 4.4.4.4 255.255.255.255
 no ip directed-broadcast
!
interface ATM12/0/0
 ip unnumbered Loopback0
 no ip directed-broadcast

 tag-switching ip
!
interface ATM12/0/1
 ip unnumbered Loopback0
 no ip directed-broadcast

 tag-switching ip
!
router ospf 100
 network 4.0.0.0 0.255.255.255 area 0
!
ip classless
!

```

P2

```

!
service timestamps debug uptime
service timestamps log uptime
!

```

```

ip subnet-zero

!
interface Loopback0
 ip address 3.3.3.3 255.255.255.255
 no ip directed-broadcast
!
interface ATM0/1/1
 ip unnumbered Loopback0
 no ip directed-broadcast

 tag-switching ip
!
interface ATM0/1/3
 ip unnumbered Loopback0
 no ip directed-broadcast

 tag-switching ip

!
router ospf 100
 network 3.0.0.0 0.255.255.255 area 0
!
ip classless
!

```

PE2

```

!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec

!
boot system flashw slot0:rsp-jsv-mz.121-5a
!

ip subnet-zero

!
ip vrf NEW
 rd 200:1
 route-target export 200:1
 route-target import 200:1
 ip cef distributed

!
interface Loopback0
 ip address 2.2.2.2 255.255.255.255
!

interface FastEthernet3/0/0
 ip vrf forwarding NEW
 ip address 110.1.1.1 255.255.255.0

 half-duplex
!

interface ATM3/1/0.1 tag-switching
 ip unnumbered Loopback0
 tag-switching ip
!

```

```

router ospf 100
  log-adjacency-changes
  network 2.0.0.0 0.255.255.255 area 0

!
router rip
  version 2
  network 110.0.0.0
  no auto-summary
  !
  address-family ipv4 vrf NEW
  version 2
  redistribute bgp 200 metric 0
  network 110.0.0.0
  no auto-summary
  exit-address-family
!
router bgp 200
  bgp log-neighbor-changes
  neighbor 1.1.1.1 remote-as 200

  neighbor 1.1.1.1 update-source Loopback0

  no auto-summary
  !
  address-family ipv4 vrf NEW
  redistribute rip
  no auto-summary
  no synchronization
  exit-address-family
  !
  address-family vpv4
  neighbor 1.1.1.1 activate
  neighbor 1.1.1.1 send-community extended
  no auto-summary
  exit-address-family
!
ip classless
!

```

CE2

```

!
version 12.1

service timestamps debug uptime
service timestamps log uptime

!

boot system disk0:c7100-jo3s56i-mz.121-5.T.bin

!
ip subnet-zero

!
interface Loopback0
  ip address 30.1.1.1 255.255.255.0
!
interface Loopback1
  ip address 30.2.2.2 255.255.255.0
!
interface Loopback2

```



```

ip address 30.3.3.3 255.255.255.0
!
interface FastEthernet0/0
ip address 110.1.1.2 255.255.255.0

!
router rip
version 2
network 30.0.0.0
network 110.0.0.0
no auto-summary
!

```

show Commands

Use the following commands to test that your network is operating properly:

- **show ip route** – Displays IP routing table entries.
- **show ip rip database vrf** – Shows information contained in the RIP database for a particular VRF.
- **show ip bgp vpnv4 vrf** – Displays VPN address information from the BGP table.
- **show tag-switching interfaces detail** – Displays information about one or more interfaces that have the MPLS feature enabled.
- **show tag-switching tdp bindings** – Displays the requested entries from the ATM LDP label binding database.
- **show tag-switching forwarding-table vrf** – Checks the label stack used for a particular route.

The output shown below is a result of entering these commands on the devices shown in the network diagram above. This output shows that the network is operating properly.

CE1

```

Cisco4500#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

    100.0.0.0/24 is subnetted, 1 subnets
C       100.1.1.0 is directly connected, Ethernet0
    110.0.0.0/24 is subnetted, 1 subnets
R       110.1.1.0 [120/1] via 100.1.1.1, 00:00:14, Ethernet0
    10.0.0.0/24 is subnetted, 3 subnets
C       10.3.3.0 is directly connected, Loopback2
C       10.2.2.0 is directly connected, Loopback1
C       10.1.1.0 is directly connected, Loopback0
    30.0.0.0/24 is subnetted, 3 subnets
R       30.3.3.0 [120/1] via 100.1.1.1, 00:00:14, Ethernet0
R       30.2.2.0 [120/1] via 100.1.1.1, 00:00:15, Ethernet0
R       30.1.1.0 [120/1] via 100.1.1.1, 00:00:15, Ethernet0

```

PE1

```
Cisco7500a#show ip route
```

```
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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
```

```
10.0.0.0/32 is subnetted, 1 subnets
C    1.1.1.1 is directly connected, Loopback0
2.0.0.0/32 is subnetted, 1 subnets
O    2.2.2.2 [110/4] via 4.4.4.4, 18:17:37, ATM2/0/0.10
3.0.0.0/32 is subnetted, 1 subnets
O    3.3.3.3 [110/3] via 4.4.4.4, 18:17:37, ATM2/0/0.10
4.0.0.0/32 is subnetted, 1 subnets
O    4.4.4.4 [110/2] via 4.4.4.4, 18:17:37, ATM2/0/0.10
```

```
Cisco7500a#show ip route vrf NEW
```

```
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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
```

```
100.0.0.0/24 is subnetted, 1 subnets
C    100.1.1.0 is directly connected, Ethernet2/1/0
110.0.0.0/24 is subnetted, 1 subnets
B    110.1.1.0 [200/0] via 2.2.2.2, 00:26:11
10.0.0.0/24 is subnetted, 3 subnets
R    10.3.3.0 [120/1] via 100.1.1.2, 00:00:11, Ethernet2/1/0
R    10.2.2.0 [120/1] via 100.1.1.2, 00:00:11, Ethernet2/1/0
R    10.1.1.0 [120/1] via 100.1.1.2, 00:00:11, Ethernet2/1/0
30.0.0.0/24 is subnetted, 3 subnets
B    30.3.3.0 [200/1] via 2.2.2.2, 00:26:12
B    30.2.2.0 [200/1] via 2.2.2.2, 00:26:12
B    30.1.1.0 [200/1] via 2.2.2.2, 00:26:12
```

```
Cisco7500a#show ip rip database vrf NEW
```

```
10.0.0.0/8    auto-summary
10.1.1.0/24
  [1] via 100.1.1.2, 00:00:18, Ethernet2/1/0
10.2.2.0/24
  [1] via 100.1.1.2, 00:00:18, Ethernet2/1/0
10.3.3.0/24
  [1] via 100.1.1.2, 00:00:18, Ethernet2/1/0
30.0.0.0/8    auto-summary
30.1.1.0/24   redistributed
  [1] via 2.2.2.2,
30.2.2.0/24   redistributed
  [1] via 2.2.2.2,
30.3.3.0/24   redistributed
  [1] via 2.2.2.2,
100.0.0.0/8   auto-summary
100.1.1.0/24   directly connected, Ethernet2/1/0
110.0.0.0/8   auto-summary
```

```
110.1.1.0/24   redistributed
               [1] via 2.2.2.2,
```

```
Cisco7500a#show ip bgp vpnv4 vrf NEW
```

```
BGP table version is 17, local router ID is 1.1.1.1
```

```
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal
```

```
Origin codes: i - IGP, e - EGP, ? - incomplete
```

| Network | Next Hop | Metric | LocPrf | Weight | Path |
|--|-----------|--------|--------|--------|------|
| Route Distinguisher: 200:1 (default for vrf NEW) | | | | | |
| *> 10.1.1.0/24 | 100.1.1.2 | 1 | | 32768 | ? |
| *> 10.2.2.0/24 | 100.1.1.2 | 1 | | 32768 | ? |
| *> 10.3.3.0/24 | 100.1.1.2 | 1 | | 32768 | ? |
| *>i30.1.1.0/24 | 2.2.2.2 | 1 | 100 | 0 | ? |
| *>i30.2.2.0/24 | 2.2.2.2 | 1 | 100 | 0 | ? |
| *>i30.3.3.0/24 | 2.2.2.2 | 1 | 100 | 0 | ? |
| *> 100.1.1.0/24 | 0.0.0.0 | 0 | | 32768 | ? |
| *>i110.1.1.0/24 | 2.2.2.2 | 0 | 100 | 0 | ? |

```
Cisco7500a#show tag-switching interfaces
```

| Interface | IP | Tunnel | Operational | |
|-------------|-----|--------|-------------|---------------|
| ATM2/0/0.10 | Yes | No | Yes | (ATM tagging) |

```
Cisco7500a#show tag-switching interfaces detail
```

```
Interface ATM2/0/0.10:
```

```
  IP tagging enabled
  TSP Tunnel tagging not enabled
  Tagging operational
  Tagswitching turbo vector
  MTU = 4470
  ATM tagging:
    Tag VPI = 1
    Tag VCI range = 33 - 65535
    Control VC = 0/32
```

```
Cisco7500a#show tag-switching ?
```

```
 atm-tdp      ATM Tagging Protocol information
 cos-map      Show Tag CoS ATM Multi-VC CoS Map
 forwarding-table Show the Tag Forwarding Information Base (TFIB)
 interfaces    Show per-interface tag switching
 prefix-map   Show Tag CoS Prefix Map
 tdp          Tag Distribution Protocol information
```

```
Cisco7500a#show tag-switching tdp bindings
```

```
tib entry: 1.1.1.1/32, rev 2
  local binding: tag: imp-null
tib entry: 2.2.2.2/32, rev 23
  local binding: tag: 27
tib entry: 3.3.3.3/32, rev 21
  local binding: tag: 26
tib entry: 4.4.4.4/32, rev 10
  local binding: tag: 28
```

```
Cisco7500a#show tag-switching atm-tdp bindings
```

```
Destination: 4.4.4.4/32
  Headend Router ATM2/0/0.10 (1 hop) 1/33 Active, VCD=24
Destination: 3.3.3.3/32
  Headend Router ATM2/0/0.10 (2 hops) 1/43 Active, VCD=25
Destination: 2.2.2.2/32
  Headend Router ATM2/0/0.10 (3 hops) 1/42 Active, VCD=26
Destination: 1.1.1.1/32
  Tailend Router ATM2/0/0.10 1/33 Active, VCD=24
```

```
Cisco7500a#show tag-switching forwarding-table vrf NEW
```

| Local tag | Outgoing tag or VC | Prefix or Tunnel Id | Bytes tag switched | Outgoing interface | Next Hop |
|-----------|--------------------|---------------------|--------------------|--------------------|-----------|
| 29 | Aggregate | 100.1.1.0/24[V] | 2080 | | |
| 30 | Untagged | 10.3.3.0/24[V] | 0 | Et2/1/0 | 100.1.1.2 |
| 31 | Untagged | 10.2.2.0/24[V] | 0 | Et2/1/0 | 100.1.1.2 |
| 32 | Untagged | 10.1.1.0/24[V] | 0 | Et2/1/0 | 100.1.1.2 |

P1

LS1010#**show ip route**

Codes: C - connected, S - static, I - IGRP, 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, E - EGP
 i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
 U - per-user static route, o - ODR
 T - traffic engineered route

Gateway of last resort is not set

```

    1.0.0.0/32 is subnetted, 1 subnets
O       1.1.1.1 [110/2] via 1.1.1.1, 19:00:12, ATM12/0/0
    2.0.0.0/32 is subnetted, 1 subnets
O       2.2.2.2 [110/3] via 3.3.3.3, 19:00:12, ATM12/0/1
    3.0.0.0/32 is subnetted, 1 subnets
O       3.3.3.3 [110/2] via 3.3.3.3, 19:00:12, ATM12/0/1
    4.0.0.0/32 is subnetted, 1 subnets
C       4.4.4.4 is directly connected, Loopback0

```

LS1010#**show tag-switching atm-tdp bindings**

```

Destination: 4.4.4.4/32
  Tailend Switch ATM12/0/0 1/33 Active -> Terminating Active
  Tailend Switch ATM12/0/1 1/34 Active -> Terminating Active
Destination: 2.2.2.2/32
  Transit ATM12/0/0 1/42 Active -> ATM12/0/1 1/35 Active
Destination: 1.1.1.1/32
  Transit ATM12/0/1 1/33 Active -> ATM12/0/0 1/33 Active
Destination: 3.3.3.3/32
  Transit ATM12/0/0 1/43 Active -> ATM12/0/1 1/34 Active

```

P2

LS1010#**show ip route**

Codes: C - connected, S - static, I - IGRP, 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, E - EGP
 i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
 U - per-user static route, o - ODR

Gateway of last resort is 10.118.1.21 to network 0.0.0.0

```

    1.0.0.0/32 is subnetted, 1 subnets
O       1.1.1.1 [110/3] via 4.4.4.4, 19:46:00, ATM0/1/1
    2.0.0.0/32 is subnetted, 1 subnets
O       2.2.2.2 [110/2] via 2.2.2.2, 19:46:00, ATM0/1/3
    3.0.0.0/32 is subnetted, 1 subnets
C       3.3.3.3 is directly connected, Loopback0
    4.0.0.0/32 is subnetted, 1 subnets
O       4.4.4.4 [110/2] via 4.4.4.4, 19:46:00, ATM0/1/1
    10.0.0.0/24 is subnetted, 1 subnets
C       10.118.1.0 is directly connected, Ethernet2/0/0

```

```
S* 0.0.0.0/0 [1/0] via 10.118.1.21
```

```
LS1010#show tag-switching atm-tdp bindings
```

```
Destination: 1.1.1.1/32
  Transit ATM0/1/3 1/33 Active -> ATM0/1/1 1/33 Active
Destination: 3.3.3.3/32
  Tailend Switch ATM0/1/3 1/34 Active -> Terminating Active
  Tailend Switch ATM0/1/1 1/34 Active -> Terminating Active
Destination: 4.4.4.4/32
  Transit ATM0/1/3 1/35 Active -> ATM0/1/1 1/34 Active
Destination: 2.2.2.2/32
  Transit ATM0/1/1 1/35 Active -> ATM0/1/3 1/33 Active
```

PE2

```
Cisco7500#show ip route
```

```
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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
```

```
1.0.0.0/32 is subnetted, 1 subnets
O    1.1.1.1 [110/4] via 3.3.3.3, 02:58:46, ATM3/1/0.1
2.0.0.0/32 is subnetted, 1 subnets
C    2.2.2.2 is directly connected, Loopback0
3.0.0.0/32 is subnetted, 1 subnets
O    3.3.3.3 [110/2] via 3.3.3.3, 02:58:46, ATM3/1/0.1
4.0.0.0/32 is subnetted, 1 subnets
O    4.4.4.4 [110/3] via 3.3.3.3, 02:58:46, ATM3/1/0.1
```

```
Cisco7500#show ip route vrf NEW
```

```
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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
```

```
100.0.0.0/24 is subnetted, 1 subnets
B    100.1.1.0 [200/0] via 1.1.1.1, 01:16:13
110.0.0.0/24 is subnetted, 1 subnets
C    110.1.1.0 is directly connected, FastEthernet3/0/0
10.0.0.0/24 is subnetted, 3 subnets
B    10.3.3.0 [200/1] via 1.1.1.1, 01:16:13
B    10.2.2.0 [200/1] via 1.1.1.1, 01:16:13
B    10.1.1.0 [200/1] via 1.1.1.1, 01:16:13
30.0.0.0/24 is subnetted, 3 subnets
R    30.3.3.0 [120/1] via 110.1.1.2, 00:00:16, FastEthernet3/0/0
R    30.2.2.0 [120/1] via 110.1.1.2, 00:00:17, FastEthernet3/0/0
R    30.1.1.0 [120/1] via 110.1.1.2, 00:00:17, FastEthernet3/0/0
```

```
Cisco7500#show ip rip database vrf NEW
```

```
10.0.0.0/8    auto-summary
10.1.1.0/24   redistributed
              [1] via 1.1.1.1,
```

```

10.2.2.0/24    redistributed
               [1] via 1.1.1.1,
10.3.3.0/24    redistributed
               [1] via 1.1.1.1,
30.0.0.0/8     auto-summary
30.1.1.0/24
               [1] via 110.1.1.2, 00:00:09, FastEthernet3/0/0
30.2.2.0/24
               [1] via 110.1.1.2, 00:00:09, FastEthernet3/0/0
30.3.3.0/24
               [1] via 110.1.1.2, 00:00:09, FastEthernet3/0/0
100.0.0.0/8    auto-summary
100.1.1.0/24   redistributed
               [1] via 1.1.1.1,
110.0.0.0/8    auto-summary
110.1.1.0/24   directly connected, FastEthernet3/0/0
Cisco7500#show ip bgp vpnv4 vrf NEW
BGP table version is 17, local router ID is 2.2.2.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete

```

| Network | Next Hop | Metric | LocPrf | Weight | Path |
|--|-----------|--------|--------|--------|------|
| Route Distinguisher: 200:1 (default for vrf NEW) | | | | | |
| *>i10.1.1.0/24 | 1.1.1.1 | 1 | 100 | 0 | ? |
| *>i10.2.2.0/24 | 1.1.1.1 | 1 | 100 | 0 | ? |
| *>i10.3.3.0/24 | 1.1.1.1 | 1 | 100 | 0 | ? |
| *> 30.1.1.0/24 | 110.1.1.2 | 1 | | 32768 | ? |
| *> 30.2.2.0/24 | 110.1.1.2 | 1 | | 32768 | ? |
| *> 30.3.3.0/24 | 110.1.1.2 | 1 | | 32768 | ? |
| *>i100.1.1.0/24 | 1.1.1.1 | 0 | 100 | 0 | ? |
| *> 110.1.1.0/24 | 0.0.0.0 | 0 | | 32768 | ? |

Cisco7500#show tag-switching interfaces

| Interface | IP | Tunnel | Operational | |
|------------|-----|--------|-------------|---------------|
| ATM3/1/0.1 | Yes | No | Yes | (ATM tagging) |

Cisco7500#show tag-switching interfaces detail

```

Interface ATM3/1/0.1:
  IP tagging enabled
  TSP Tunnel tagging not enabled
  Tagging operational
  Tagswitching turbo vector
  MTU = 4470
  ATM tagging:
    Tag VPI = 1
    Tag VCI range = 33 - 65535
    Control VC = 0/32

```

Cisco7500#show tag-switching ?

```

atm-tdp      ATM Tagging Protocol information
cos-map      Show Tag CoS ATM Multi-VC CoS Map
forwarding-table Show the Tag Forwarding Information Base (TFIB)
interfaces    Show per-interface tag switching
prefix-map    Show Tag CoS Prefix Map
tdp          Tag Distribution Protocol information

```

Cisco7500#show tag-switching tdp bindings

```

tib entry: 1.1.1.1/32, rev 25
  local binding: tag: 26
tib entry: 2.2.2.2/32, rev 2
  local binding: tag: imp-null
tib entry: 3.3.3.3/32, rev 27
  local binding: tag: 27
tib entry: 4.4.4.4/32, rev 29

```

```
local binding: tag: 28
```

```
Cisco7500#show tag-switching atm-tdp bindings
```

```
Destination: 1.1.1.1/32
  Headend Router ATM3/1/0.1 (3 hops) 1/33 Active, VCD=8
Destination: 3.3.3.3/32
  Headend Router ATM3/1/0.1 (1 hop) 1/34 Active, VCD=6
Destination: 4.4.4.4/32
  Headend Router ATM3/1/0.1 (2 hops) 1/35 Active, VCD=7
Destination: 2.2.2.2/32
  Tailend Router ATM3/1/0.1 1/33 Active, VCD=8
```

```
Cisco7500#show tag-switching forwarding-table vrf NEW
```

| Local tag | Outgoing tag or VC | Prefix or Tunnel Id | Bytes switched | tag | Outgoing interface | Next Hop |
|-----------|--------------------|---------------------|----------------|-----|--------------------|-----------|
| 33 | Aggregate | 110.1.1.0/24[V] | 0 | | | |
| 34 | Untagged | 30.3.3.0/24[V] | 0 | | Fa3/0/0 | 110.1.1.2 |
| 35 | Untagged | 30.2.2.0/24[V] | 0 | | Fa3/0/0 | 110.1.1.2 |
| 36 | Untagged | 30.1.1.0/24[V] | 0 | | Fa3/0/0 | 110.1.1.2 |

CE2

```
Cisco7100#show ip route
```

```
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
i - IS-IS, 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
```

```
100.0.0.0/24 is subnetted, 1 subnets
R    100.1.1.0 [120/1] via 110.1.1.1, 00:00:19, FastEthernet0/0
110.0.0.0/24 is subnetted, 1 subnets
C    110.1.1.0 is directly connected, FastEthernet0/0
10.0.0.0/24 is subnetted, 3 subnets
R    10.3.3.0 [120/1] via 110.1.1.1, 00:00:19, FastEthernet0/0
R    10.2.2.0 [120/1] via 110.1.1.1, 00:00:19, FastEthernet0/0
R    10.1.1.0 [120/1] via 110.1.1.1, 00:00:19, FastEthernet0/0
30.0.0.0/24 is subnetted, 3 subnets
C    30.3.3.0 is directly connected, Loopback2
C    30.2.2.0 is directly connected, Loopback1
C    30.1.1.0 is directly connected, Loopback0
```

Related Information

- [MPLS Virtual Private Networks](#)
 - [Configuring a Basic MPLS VPN](#)
 - [Packet Flow in an MPLS VPN Environment](#)
 - [More MPLS over ATM information](#)
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