

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

Document ID: 10533

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Introduction

This document shows how to configure Virtual Private Network (VPN) Multiprotocol Label Switching (MPLS) over ATM with 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.

Prerequisites

Requirements

There are no specific requirements for this document.

Conventions

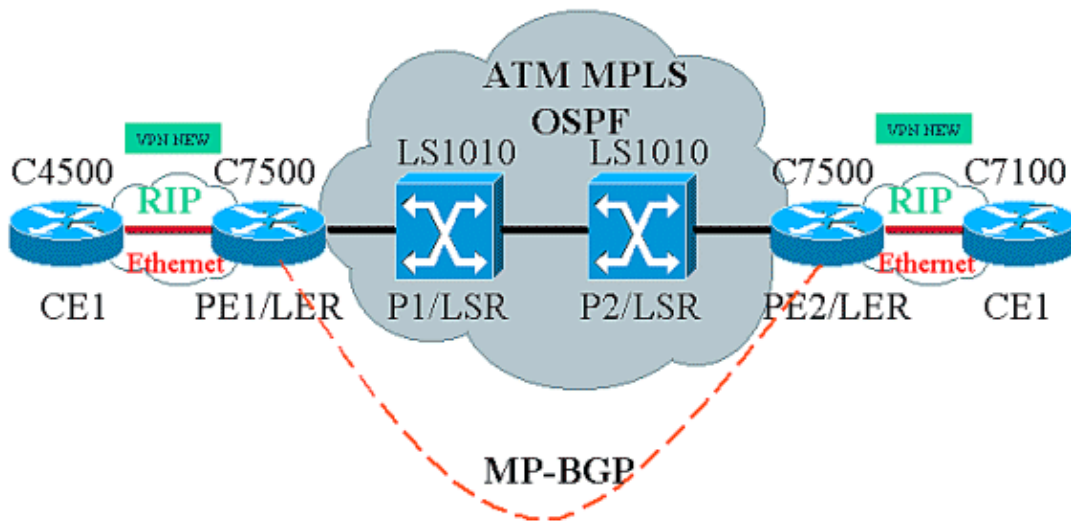
Refer to Cisco Technical Tips Conventions for more information on document conventions.

Configure

In this section, you are presented with the information to configure the features described in this document.

Network Diagram

This document uses this network setup:



Network Description

The current setup contains these elements in VPN terminology:

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

The current setup contains these elements in MPLS terminology:

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

Configurations

This document uses these configurations:

- 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 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 do Open Shortest Path First (OSPF) and are all in Area 0. OSPF is the Interior Gateway Protocol (IGP) used in the ATM network. Tag-switching is used 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.
- The setup maintains separate VRF routing tables in the PE1 and PE2 routers.
- The name of the VPN used in this example is NEW.

CE1
<pre>! version 12.1 service timestamps debug datetime msec</pre>

```
service timestamps log datetime msec
!
boot system flashow 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
 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 flashow 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 flash 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 vpnv4
 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 these commands to test that your network operates 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 these entered commands on the devices shown in the network diagram. This output shows that the network operates 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

```

    1.0.0.0/32 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   Outgoing   Prefix          Bytes tag   Outgoing   Next Hop
tag     tag or VC  or Tunnel Id   switched   interface
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
```

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- [MPLS Virtual Private Networks](#)
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