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

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Contents

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

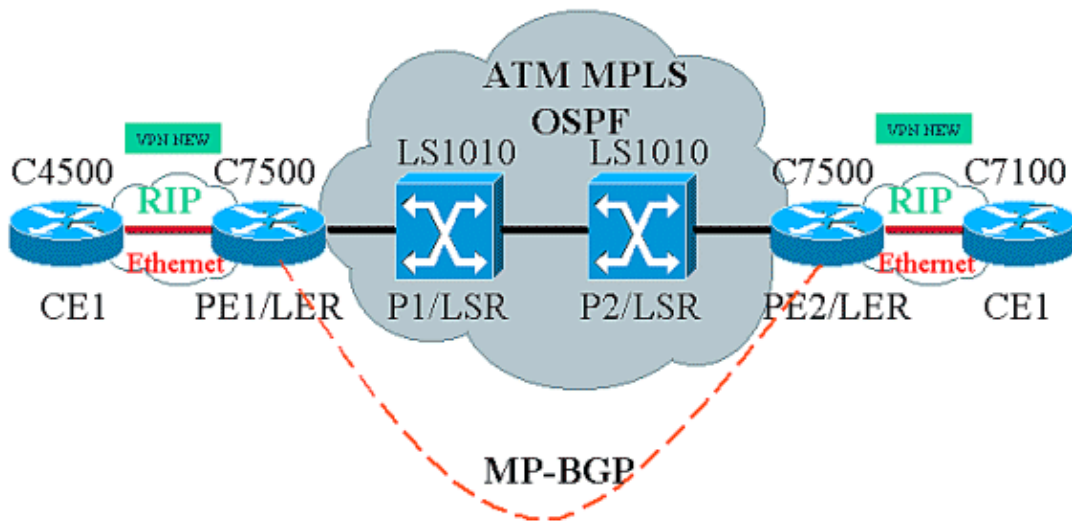There are no specific requirements for this document.

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
| ```
!
version 12.1
service timestamps debug datetime msec
``` |

```
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
!
```

```
!
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 flashow 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  Outgoing    Prefix           Bytes tag  Outgoing    Next Hop
   tag    tag or VC   or Tunnel Id     switched   interface
   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
```

Related Information

- **MPLS Virtual Private Networks**
- **Configuring a Basic MPLS VPN**
- **Packet Flow in an MPLS VPN Environment**
- **Technical Support & Documentation – Cisco Systems**