

# Настройка VPN MPLS через ATM с маршрутизаторами Cisco 7500 и коммутаторами LightStream 1010

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## [Введение](#)

Этот документ показывает, как настроить Многопротокольную коммутацию по меткам (MPLS) over ATM Виртуальной частной сети (VPN) с Маршрутизаторами Cisco 7500 как Граничные меточные маршрутизаторы (LER) и коммутаторы LightStream 1010 как Маршрутизаторы с коммутацией меток (LSR). Два подключенных маршрутизатора ethernet, каждый на удаленном клиентском узле сети, являются частью VPN. В этом документе мы посмотрели на конфигурации сквозного соединения устройств и полезные команды показа.

## [Предварительные условия](#)

### [Требования](#)

Для этого документа отсутствуют особые требования.

### [Условные обозначения](#)

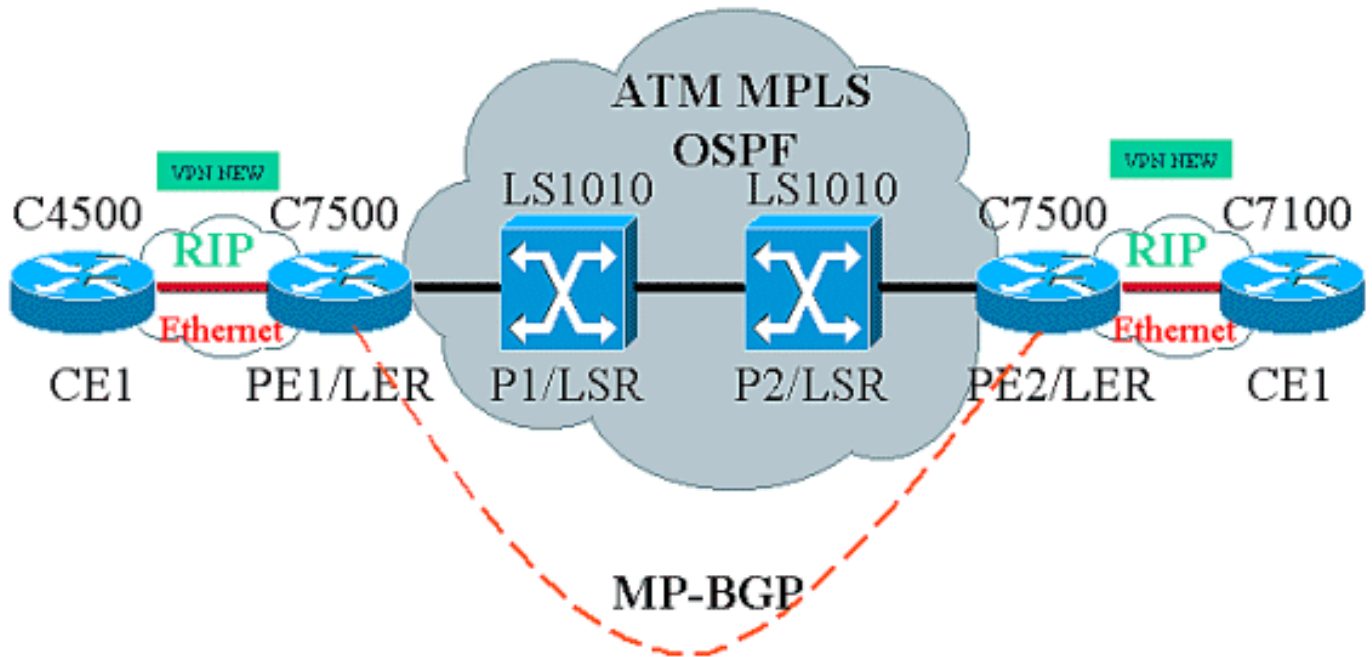
[Дополнительные сведения об условных обозначениях см. в документе Условные обозначения технических терминов Cisco.](#)

## [Настройка](#)

В этом разделе содержатся сведения о настройке функций, описанных в этом документе.

## Схема сети

В настоящем документе используется следующая схема сети:



## Описание сети

Текущая настройка содержит эти элементы в терминологии VPN:

- CE = граничный маршрутизатор клиента
- PE = маршрутизатор на стороне провайдера
- Маршрутизатор P=Provider

Текущая настройка содержит эти элементы в терминологии MPLS:

- LER = граничный меточный маршрутизатор
- LSR = маршрутизатор с коммутацией меток
- TDP/LDP = Протокол распределения Метки / Протокол распределения меток

## Конфигурации

Эти конфигурации используются в данном документе:

- PE1 и PE2 являются LER в нашей сети ATM.
- P1 и P2 являются LSR.
- CE1 и CE2 являются Граничные маршрутизаторы клиента, которые не создают и не выполняют VPN или MPLS.
- CE1 и CE2 являются Ethernet, связанной с PE1 и PE2 соответственно, и выполняют Протокол RIP.
- PE1, PE2, P1 и P2 делают Протокол OSPF и являются всеми в области 0. OSPF является Протокол IGP, используемый в сети ATM. Коммутация на основе тэгов используется на ATM-интерфейсах на всех четырех устройствах ATM. Протокол

- распределения тегов (TDP) назначает Метки на маршруты OSPF.
- PE1 и PE2 является Многопротокольный протокол краевого шлюза (MP-BGP) узлы.
  - Маршруты RIP перераспределены в MP-BGP. Маршруты MP-BGP, перераспределенные в RIP на PE1 и маршрутизаторах PE2.
  - Настройка поддерживает отдельные таблицы маршрутизации VRF в маршрутизаторах PE2 и PE1.
  - Названием VPN, используемой в данном примере, является NEW.

## CE 1

```
!  
version 12.1  
service timestamps debug datetime msec  
service timestamps log datetime msec  
  
!  
boot system flasho 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  
!
```

## PE 1

```
!  
version 12.1  
  
service timestamps debug uptime  
service timestamps log uptime  
  
!  
boot system flasho 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  
!
```

## PE 2

```
!  
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 vpnv4
  neighbor 1.1.1.1 activate
```

```
neighbor 1.1.1.1 send-community extended
no auto-summary
exit-address-family
!
ip classless
!
```

## CE 2

```
!
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"

Чтобы проверить правильность работы сети, воспользуйтесь такой командой:

- **show ip route** — отображаются элементы таблицы IP-маршрутизации.
- **show ip rip database vrf** – показывает информацию, содержащуюся в базе данных RIP для отдельного VRF.
- **show ip bgp vpnv4 vrf** – отображает адреса VPN из таблицы BGP.
- **show tag-switching interfaces detail** - Отображает информацию об одном или более интерфейсах, которым включили функцию MPLS.
- **show tag-switching tdp bindings** - Отображает запрошенные записи от базы данных привязки меток LDP ATM.
- **show tag-switching forwarding-table vrf** - Проверяет стек меток, используемый для отдельного маршрута.

Выходные данные, показанные ниже, являются результатом этих введенных команд на устройствах, показанных в схеме сети. Эти выходные данные показывают, что сеть работает правильно.

## CE 1

```
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
```

## PE 1

```
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
```

## PE 2

```
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

```

## CE 2

```

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

```

## Дополнительные сведения

- [Виртуальные частные сети MPLS](#)
- [Выбор базовой конфигурации для MPLS VPN](#)
- [Поток пакетов в среде MPLS VPN](#)
- [Cisco Systems – техническая поддержка и документация](#)