

在Cisco IOS中配置mVPN配置文件

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简介

本文档介绍如何在Cisco IOS®中配置每个组播VPN(mVPN)配置文件。

注意：本文档中描述的配置适用于提供商边缘(PE)路由器。

先决条件

要求

在继续执行本文档中描述的配置之前，请验证运行Cisco IOS的特定平台上是否支持mVPN配置文件。

使用的组件

本文档中的信息基于Cisco IOS的所有版本。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

配置

本节介绍如何在Cisco IOS中配置mVPN配置文件。

注意：使用命令查找工具（仅限注册用户）可获取有关本部分所使用命令的详细信息。

mVPN配置文件

注意：Cisco IOS目前不支持所有配置文件。

注意：本文档中使用的虚拟路由/转发(VRF)是VRF。Rosen *MLDP*已重命名为“默认MDT”。

为全局情景或每个VRF配置mVPN配置文件。在Cisco IOS中配置mVPN配置文件时，可以使用旧方法或新方法来定义VRF。

以下是旧方法的示例：

```
ip vrf one
rd 1:1
route-target export 1:1
```

```
route-target import 1:1
```

以下是新方法的示例：

```
vrf definition one
rd 1:1
!
address-family ipv4
  route-target export 1:1
  route-target import 1:1
exit-address-family
```

对于全局情景中的配置文件，必须启用组播路由：

```
ip multicast-routing
```

对于VRF情景中的配置文件，必须为VRF启用组播路由：

```
ip multicast-routing vrf one
```

您可以使用以下全局命令为具有MLDP的配置文件启用多点标签分发协议(MLDP)的日志记录：

```
mpls mldp logging notifications
```

对于两种情况（全局或VRF环境），必须在提供商边缘 — 客户边缘(PE-CE)链路上为提供商边缘(PE)路由器启用协议无关组播(PIM):

```
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
```

用于MLDP的FRR

Cisco IOS中提供MLDP的快速重路由(FRR)。MLDP为控制平面协议的组播流量必须使用主要流量工程(TE)隧道，以使流量受FRR保护。主TE隧道可以是手动TE隧道或主自动隧道。链路必须由TE FRR保护，即手动备份隧道或备份自动隧道。

本示例使用手动主备份隧道和手动备份隧道。

必须配置此全局命令，MLDP才能使用多协议标签交换(MPLS)TE隧道：

```
mpls mldp path traffic-eng
```

此配置用于主单跳隧道使用的受保护接口：

```
interface Ethernet3/0
  ip address 10.1.6.6 255.255.255.0
  load-interval 30
  mpls ip
  mpls traffic-eng tunnels
mpls traffic-eng backup-path Tunnel0
  ip rsvp bandwidth 10000
end
```

此配置用于备份隧道：

```

interface Tunnel0
 ip unnumbered Loopback0
 load-interval 30
 tunnel source Loopback0
 tunnel mode mpls traffic-eng
 tunnel destination 10.100.1.3
 tunnel mpls traffic-eng path-option 1 explicit name P6-to-P3

```

此配置用于主单跳隧道：

```

interface Tunnel1
 ip unnumbered Loopback0
 load-interval 30
mpls ip
 tunnel source Loopback0
 tunnel mode mpls traffic-eng
 tunnel destination 10.100.1.3
tunnel mpls traffic-eng autoroute announce
 tunnel mpls traffic-eng path-option 1 explicit name P6-to-P3-direct
tunnel mpls traffic-eng fast-reroute

```

注意：在主隧道上需要**mpls ip**配置，因为必须在受保护的隧道上启用MLDP。为确保TE隧道用于转发流量，需要**autoroute announce**配置。

MLDP的MBB

Cisco IOS支持Make Before Break(MBB)功能，但只支持在新路径可用后使用固定延迟的方法。Cisco IOS中没有查询/确认机制。

以下是用于配置MBB固定延迟的全局命令：

```

P1(config)#mpls mldp make-before-break delay ?
<0-60000> Delay in milliseconds

```

默认值为0，因此默认情况下没有MBB。

配置文件

本节介绍每个mVPN配置文件所需的配置。

配置文件0默认MDT - GRE - PIM C-mcast信令

将此配置用于配置文件0:

```

vrf definition one
 rd 1:1
 !
 address-family ipv4
  mdt default 232.1.1.1
  route-target export 1:1
  route-target import 1:1
 exit-address-family
 !
 ip multicast-routing

```

```

ip multicast-routing vrf one

interface Loopback0
ip address 10.100.1.1 255.255.255.255
ip pim sparse-mode
!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!

router bgp 1
bgp log-neighbor-changes
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family vpnv4
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
neighbor 10.100.1.7 route-reflector-client
exit-address-family
!
address-family ipv4 mdt
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
redistribute connected
neighbor 10.2.1.8 remote-as 65001
neighbor 10.2.1.8 activate
exit-address-family
!

```

注意：对于此配置文件，必须在全局环回接口上启用PIM。地址系列(AF)IPv4组播分布树(MDT)必须用于核心中所有类型的PIM信令(不仅用于PIM源特定组播(SSM))。

配置文件1默认MDT - MLDP MP2MP - PIM C-mcast信令

将此配置用于配置文件1:

```

vrf definition one
rd 1:2
vpn id 1000:2000
!
address-family ipv4
mdt default mpls mldp 10.100.1.1
route-target export 1:1
route-target import 1:1
exit-address-family
!

ip multicast-routing vrf one

mpls mldp logging notifications

router bgp 1
bgp log-neighbor-changes
neighbor 10.100.1.7 remote-as 1

```

```

neighbor 10.100.1.7 update-source Loopback0
!
address-family vpnv4
  neighbor 10.100.1.7 activate
  neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
  redistribute connected
  neighbor 10.2.2.9 remote-as 65002
  neighbor 10.2.2.9 activate
exit-address-family

```

配置文件2分区MDT - MLDP MP2MP - PIM C-mcast信令

Cisco IOS当前不支持配置文件2，并且MLDP不支持分区MDT和多点对多点(MP2MP)。

配置文件3默认MDT - GRE - BGP-AD - PIM C-mcast信令

将此配置用于配置文件3:

```

vrf definition one
rd 1:1
!
address-family ipv4
  mdt auto-discovery pim
  mdt default 232.1.1.1
  route-target export 1:1
  route-target import 1:1
exit-address-family
!

ip multicast-routing vrf one
!
interface Loopback0
ip address 10.100.1.1 255.255.255.255
ip pim sparse-mode
!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!
router bgp 1
bgp log-neighbor-changes
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
  address-family ipv4 mvpn
  neighbor 10.100.1.7 activate
  neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
  neighbor 10.100.1.7 activate
  neighbor 10.100.1.7 send-community extended
exit-address-family
!

```

```
address-family ipv4 vrf one
 redistribute connected
 neighbor 10.2.1.8 remote-as 65001
 neighbor 10.2.1.8 activate
exit-address-family
```

注意：对于此配置文件，必须在全局环回接口上启用PIM。由于使用PIM的边界网关协议自动发现(BGP-AD)，因此不再需要AF IPv4 MDT (配置文件0需要AF IPv4 MDT)。

配置文件4分区MDT - MLDP MP2MP - BGP-AD - PIM C-mcast信令

Cisco IOS当前不支持配置文件4，并且MLDP不支持带MP2MP的分区MDT。

配置文件5分区MDT - MLDP P2MP - BGP-AD - PIM C-mcast信令

Cisco IOS当前不支持配置文件5，分区MDT不支持PIM信令。

配置文件6 VRF MLDP — 带内信令

将此配置用于配置文件6:

```
vrf definition one
rd 1:1
!
address-family ipv4
 route-target export 1:1
 route-target import 1:1
exit-address-family
!
ip multicast-routing vrf one
ip multicast vrf one mpls mldp

!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!

router bgp 1
bgp log-neighbor-changes
neighbor 10.2.1.8 remote-as 65001
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
!
address-family vpnv4
 neighbor 10.100.1.7 activate
 neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
 redistribute connected
 neighbor 10.2.1.8 remote-as 65001
 neighbor 10.2.1.8 activate
```

```
exit-address-family
!
```

```
ip pim vrf one mpls source Loopback0
```

Profile 7全局MLDP带内信令

将此配置用于配置文件7:

```
ip multicast-routing
```

```
ip multicast mpls mldp
```

```
interface Loopback0
ip address 10.100.1.1 255.255.255.255
ip pim sparse-mode
!
```

```
interface Ethernet2/0
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
```

```
router bgp 1
bgp log-neighbor-changes
neighbor 10.2.1.8 remote-as 65001
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
```

```
address-family ipv4
 redistribute connected
 neighbor 10.2.1.8 activate
 neighbor 10.100.1.7 activate
exit-address-family
```

```
ip pim ssm default
```

```
ip pim mpls source Loopback0
```

配置文件8全局静态 — P2MP-TE

本节介绍TE头端和TE尾端路由器上配置文件8的所需配置。

TE头端路由器

在TE头端路由器上对配置文件8使用以下配置：

```
ip multicast-routing
```

```
ip multicast mpls traffic-eng
```

```
mpls traffic-eng tunnels
mpls traffic-eng destination list name from-PE3
ip 10.100.1.1 path-option 1 dynamic
ip 10.100.1.2 path-option 1 dynamic
ip 10.100.1.4 path-option 1 explicit name to-PE4
```

```
interface Tunnel0
ip unnumbered Loopback0
ip pim passive
```



```

ip igmp static-group 232.1.1.1 source 10.2.3.10
tunnel mode mpls traffic-eng point-to-multipoint
  tunnel destination list mpls traffic-eng name from-PE3
!

interface Ethernet1/0
ip address 10.1.10.3 255.255.255.0
mpls traffic-eng tunnels
ip rsvp bandwidth 10000

!
router ospf 1
network 10.1.7.0 0.0.0.255 area 0
network 10.1.10.0 0.0.0.255 area 0
network 10.100.0.0 0.0.255.255 area 0
mpls traffic-eng router-id Loopback0
mpls traffic-eng area 0
!

router bgp 1
bgp log-neighbor-changes
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4
  redistribute connected
  neighbor 10.100.1.7 activate
exit-address-family

ip pim ssm default

```

注意：点对多点(P2MP)TE隧道的尾端路由器需要目标列表。通向尾端路由器的path-option可以是显式的，也可以是动态的。

TE尾端路由器

在TE尾端路由器上对配置文件8使用以下配置：

```

ip multicast-routing
ip multicast mpls traffic-eng

mpls traffic-eng tunnels
interface Ethernet0/0
ip address 10.1.1.1 255.255.255.0
mpls traffic-eng tunnels
ip rsvp bandwidth 10000

router bgp 1
bgp log-neighbor-changes
neighbor 10.2.1.8 remote-as 65001
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4
  redistribute connected
  neighbor 10.2.1.8 activate
  neighbor 10.100.1.7 activate
exit-address-family

```

```
ip pim ssm default
```

```
ip mroute 10.2.3.0 255.255.255.0 10.100.1.3
```

注意：在全局环境中，源到TE头端路由器需要静态mroute。

配置文件9默认MDT - MLDP - MP2MP - BGP-AD - PIM C-mcast信令

将此配置用于配置文件9:

```
vrf definition one
rd 1:1
vpn id 1000:2000
!
address-family ipv4
  mdt auto-discovery mldp
  mdt default mpls mldp 10.100.1.3
  route-target export 1:1
  route-target import 1:1
exit-address-family
!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode

router bgp 1
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4 mvpn
  neighbor 10.100.1.7 activate
  neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
  neighbor 10.100.1.7 activate
  neighbor 10.100.1.7 send-community extended
exit-address-family
!
```

配置文件10 VRF静态 — P2MP TE - BGP-AD

Cisco IOS当前不支持配置文件10,P2MP TE不支持BGP-AD。

配置文件11默认MDT - GRE - BGP-AD - BGP C-mcast信令

将此配置用于配置文件11:

```
vrf definition one
rd 1:1
!
address-family ipv4
  mdt auto-discovery pim
  mdt default 232.1.1.1
  mdt overlay use-bgp
route-target export 1:1
```

```

route-target import 1:1
exit-address-family
!

ip multicast-routing vrf one
!
interface Loopback0
ip address 10.100.1.1 255.255.255.255
ip pim sparse-mode
!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!
router bgp 1
bgp log-neighbor-changes
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4 mvpn
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
redistribute connected
neighbor 10.2.1.8 remote-as 65001
neighbor 10.2.1.8 activate
exit-address-family

```

注意：对于此配置文件，必须在全局环回接口上启用PIM。由于使用PIM的BGP-AD，因此不再需要AF IPv4 MDT（配置文件0需要AF IPv4 MDT）。

配置文件12默认MDT - MLDP - P2MP - BGP-AD - BGP C-mcast信令

将此配置用于配置文件12:

```

vrf definition one
rd 1:1
!
address-family ipv4
mdt auto-discovery mldp
mdt default mpls mldp p2mp
mdt overlay use-bgp
route-target export 1:1
route-target import 1:1
exit-address-family
!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!

```

```

router bgp 1
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4 mvpn
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
redistribute connected
neighbor 10.2.1.8 remote-as 65001
neighbor 10.2.1.8 activate
exit-address-family
!

```

配置文件13默认MDT - MLDP - MP2MP - BGP-AD - BGP C-mcast信令

将此配置用于配置文件13:

```

vrf definition one
rd 1:1
vpn id 1000:2000
!
address-family ipv4
mdt auto-discovery mldp
mdt default mpls mldp 10.100.1.3
mdt overlay use-bgp
route-target export 1:1
route-target import 1:1
exit-address-family
!

interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode

router bgp 1
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4 mvpn
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!

```

配置文件14分区MDT - MLDP P2MP - BGP-AD - BGP C-mast信令

将此配置用于配置文件14:

```

vrf definition one
rd 1:1
!
address-family ipv4
  mdt auto-discovery mldp
  mdt strict-rpf interface
  mdt partitioned mldp p2mp
  mdt overlay use-bgp
  route-target export 1:1
  route-target import 1:1
exit-address-family

!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!

router bgp 1
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4 mvpn
  neighbor 10.100.1.7 activate
  neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
  neighbor 10.100.1.7 activate
  neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
  redistribute connected
  neighbor 10.2.1.8 remote-as 65001
  neighbor 10.2.1.8 activate
exit-address-family
!

```

配置文件15分区MDT - MLDP MP2MP - BGP-AD - BGP C-mast信令

配置文件15当前在Cisco IOS中不受支持，并且MLDP不支持使用MP2MP的分区MDT。

配置文件16默认MDT静态 — P2MP TE - BGP-AD - BGP C-mcast信令

Cisco IOS当前不支持配置文件16。

配置文件17默认MDT - MLDP - P2MP - BGP-AD - PIM C-mcast信令

将此配置用于配置文件17:

```

vrf definition one
rd 1:1
!
address-family ipv4
  mdt auto-discovery mldp
  mdt default mpls mldp p2mp

```

```

    route-target export 1:1
    route-target import 1:1
exit-address-family
!

interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!

router bgp 1
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4 mvpn
    neighbor 10.100.1.7 activate
    neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
    neighbor 10.100.1.7 activate
    neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
    redistribute connected
    neighbor 10.2.1.8 remote-as 65001
    neighbor 10.2.1.8 activate
exit-address-family
!

```

配置文件18默认MDT静态 — P2MP TE - BGP-AD - PIM C-mcast信令

Cisco IOS当前不支持配置文件18。

配置文件19默认MDT - IR - BGP-AD - PIM C-mcast信令

```

vrf definition one
    rd 1:1
    !
    address-family ipv4
        mdt auto-discovery ingress-replication
        mdt default ingress-replication
        route-target export 1:1
        route-target import 1:1
    exit-address-family

!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!

router bgp 1
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4 mvpn
    neighbor 10.100.1.7 activate

```

```

neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
redistribute connected
neighbor 10.2.1.8 remote-as 65001
neighbor 10.2.1.8 activate
exit-address-family
!

```

配置文件20默认MDT - P2MP-TE - BGP-AD - PIM - C-mcast信令

Cisco IOS当前不支持Profile 20和P2MP Auto-Tunnels TE。

配置文件21默认MDT - IR - BGP-AD - BGP - C-mcast信令

```

vrf definition one
rd 1:1
!
address-family ipv4
mdt auto-discovery ingress-replication
mdt default ingress-replication
mdt overlay use-bgp
route-target export 1:1
route-target import 1:1
exit-address-family

!
interface Ethernet2/0
vrf forwarding one
ip address 10.2.1.1 255.255.255.0
ip pim sparse-mode
!

router bgp 1
neighbor 10.100.1.7 remote-as 1
neighbor 10.100.1.7 update-source Loopback0
!
address-family ipv4 mvpn
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family vpnv4
neighbor 10.100.1.7 activate
neighbor 10.100.1.7 send-community extended
exit-address-family
!
address-family ipv4 vrf one
redistribute connected
neighbor 10.2.1.8 remote-as 65001
neighbor 10.2.1.8 activate
exit-address-family
!

```

配置文件22默认MDT - P2MP-TE - BGP-AD BGP - C-mcast信令

Cisco IOS当前不支持Profile 22和P2MP Auto-Tunnels TE。

配置文件23分区MDT - IR - BGP-AD - PIM C-mcast信令

Cisco IOS当前不支持配置文件23和IR。

配置文件24分区MDT - P2MP-TE - BGP-AD - PIM C-mcast信令

Cisco IOS当前不支持Profile 24和P2MP Auto-Tunnels TE。

配置文件25分区MDT - IR - BGP-AD - BGP C-mcast信令

```
vrf definition one
 rd 1:1
 !
 address-family ipv4
  mdt auto-discovery ingress-replication
  mdt default ingress-replication
  mdt overlay use-bgp
  route-target export 1:1
  route-target import 1:1
 exit-address-family
 !
 !
 interface Ethernet2/0
  vrf forwarding one
  ip address 10.2.1.1 255.255.255.0
  ip pim sparse-mode
 !
 router bgp 1
  neighbor 10.100.1.7 remote-as 1
  neighbor 10.100.1.7 update-source Loopback0
  !
  address-family ipv4 mvpn
   neighbor 10.100.1.7 activate
   neighbor 10.100.1.7 send-community extended
  exit-address-family
  !
  address-family vpnv4
   neighbor 10.100.1.7 activate
   neighbor 10.100.1.7 send-community extended
  exit-address-family
  !
  address-family ipv4 vrf one
   redistribute connected
   neighbor 10.2.1.8 remote-as 65001
   neighbor 10.2.1.8 activate
  exit-address-family
 !
```

配置文件26分区MDT - P2MP TE - BGP-AD - BGP C-mcast信令

Cisco IOS当前不支持Profile 26和P2MP Auto-Tunnels TE。

自治间mVPN

本部分提供的信息假设路由器上实施了正确配置，以便AS间MPLS VPN可以运行单播。

mVPN不支持选项D。

选项A

选项A需要常规mVPN配置。您可以在自治系统中拥有任何配置文件，并且这些配置文件不必在不同的自治系统中匹配。

PIM

对于选项B和C，如果环回接口IP地址从边界网关协议(BGP)重分发到其他自治系统(AS)的内部网关协议(IGP)，则不需要PIM矢量。

选项B

配置文件0仅支持自治系统间 (AS间) mVPN (使用非分段隧道) 。

选项B需要常规mVPN配置。只能使用AF IPv4 MDT;不支持AF IPv4 MVPN。

在PE路由器上，需要使用路由识别器(RD)来源的PIM矢量，并且还需要以下附加配置：

```
ip multicast vrf one rpf proxy rd vector
```

自治系统边界路由器(ASBR)必须在ASBR到ASBR的链路上启用PIM。ASBR还必须为内部边界网关协议(iBGP)邻居和ASBR外部边界网关协议(eBGP)邻居配置AF IPv4 MDT。

ASBR上需要此附加配置：

```
interface Ethernet0/0
description inter-as link
ip address 10.3.1.3 255.255.255.0
ip pim sparse-mode
mpls bgp forwarding

router bgp 1
bgp log-neighbor-changes
no bgp default route-target filter
neighbor 10.3.1.4 remote-as 2
neighbor 10.100.1.6 remote-as 1
neighbor 10.100.1.6 update-source Loopback0
!
address-family vpnv4
neighbor 10.3.1.4 activate
neighbor 10.3.1.4 send-community extended
neighbor 10.100.1.6 activate
neighbor 10.100.1.6 send-community extended
exit-address-family
!
address-family ipv4 mdt
neighbor 10.3.1.4 activate
neighbor 10.3.1.4 send-community extended
```

```
neighbor 10.100.1.6 activate
neighbor 10.100.1.6 send-community extended
exit-address-family
```

选项C

配置文件0仅支持自治系统间 (AS间) mVPN (使用非分段隧道) 。

选项C需要常规mVPN配置。其他AS的PE环回前缀由AF IPv4中的BGP通告。

在PE路由器上也需要不使用RD的PIM矢量源，其附加配置如下：

```
ip multicast rpf proxy vector
```

ASBR必须在ASBR到ASBR的链路上启用PIM。ASBR还必须为iBGP邻居和ASBR eBGP邻居配置AF IPv4 MDT。

ASBR上需要此附加配置：

```
interface Ethernet0/0
description inter-as link
ip address 10.3.1.3 255.255.255.0
ip pim sparse-mode
mpls bgp forwarding

router bgp 1
bgp log-neighbor-changes
neighbor 10.3.1.4 remote-as 2
neighbor 10.100.1.6 remote-as 1
neighbor 10.100.1.6 update-source Loopback0
!
address-family ipv4
redistribute ospf 1 metric 100 route-map loopbacks-into-BGP
neighbor 10.3.1.4 activate
neighbor 10.3.1.4 send-community extended
neighbor 10.3.1.4 send-label
neighbor 10.100.1.6 activate
neighbor 10.100.1.6 send-community extended
neighbor 10.100.1.6 send-label
exit-address-family
!
address-family ipv4 mdt
neighbor 10.3.1.4 activate
neighbor 10.3.1.4 send-community extended
neighbor 10.100.1.6 activate
neighbor 10.100.1.6 send-community extended
exit-address-family
!
```

注意：自治系统之间的AF IPv4 MDT也可以配置在eBGP多跳会话的路由反射器(RR)上，而不是ASBR上。

MLDP

当前不支持选项B。

选项C

Cisco IOS不支持递归转发等价类(FEC)。因此，iBGP将PE环回重分发到另一个AS是不够的，因为P（提供商）路由器不知道另一个AS中的PE路由器。

如果IGP将PE环回重分发到另一个AS，则支持。在这种情况下，支持带分区MDT和全网状P2MP MLDP的配置文件。AF IPv4 MDT不能在此处使用；必须使用AF IPv4 MVPN。BGP mVPN会话可以在PE和RR之间运行。在RR之间，已存在为AF VPNv4/6运行的eBGP多跳会话。

必须启用MLDP BGP-AD。PE路由器上**需要**inter-as关键字，以确保BGP-AD类型1路由没有no-export社区。

配置文件，带MLDP全网状P2MP

本节介绍配置文件12和17的配置。

配置文件17配置

以下是配置文件17的PE路由器配置：

```
vrf definition one
rd 1:2
!
address-family ipv4
mdt auto-discovery mldp inter-as
mdt default mpls mldp p2mp
mdt data mpls mldp 100
route-target export 1:1
route-target import 1:1
exit-address-family
```

以下是配置文件17的ASBR上的配置：

```
interface Ethernet0/0
ip address 10.3.1.3 255.255.255.0
ip pim sparse-mode
mpls ip
mpls bgp forwarding
end
```

注意：在ASBR之间的链路上需要**mpls ip**配置，以便在它们之间具有MLDP邻居关系。

以下是配置文件17的路由反射器配置：

```
router bgp 1
bgp log-neighbor-changes
neighbor 10.100.1.1 remote-as 1
neighbor 10.100.1.1 update-source Loopback0
neighbor 10.100.1.3 remote-as 1
neighbor 10.100.1.3 update-source Loopback0
neighbor 10.100.1.8 remote-as 2
neighbor 10.100.1.8 ebgp-multihop 244
neighbor 10.100.1.8 update-source Loopback0
!
address-family ipv4
neighbor 10.100.1.1 activate
```

```

neighbor 10.100.1.1 route-reflector-client
neighbor 10.100.1.1 send-label
neighbor 10.100.1.3 activate
neighbor 10.100.1.3 route-reflector-client
neighbor 10.100.1.3 send-label
no neighbor 10.100.1.8 activate
exit-address-family
!
address-family ipv4 mvpn
neighbor 10.100.1.1 activate
neighbor 10.100.1.1 send-community extended
neighbor 10.100.1.1 route-reflector-client
neighbor 10.100.1.8 activate
neighbor 10.100.1.8 send-community extended
exit-address-family
!
address-family vpnv4
neighbor 10.100.1.1 activate
neighbor 10.100.1.1 send-community extended
neighbor 10.100.1.1 route-reflector-client
neighbor 10.100.1.3 activate
neighbor 10.100.1.3 send-community extended
neighbor 10.100.1.3 route-reflector-client
neighbor 10.100.1.8 activate
neighbor 10.100.1.8 send-community extended
neighbor 10.100.1.8 next-hop-unchanged
exit-address-family
!

```

配置文件12配置

此配置与配置文件17的配置相同，但BGP还有额外的C组播信令。

以下是配置文件12的PE路由器配置：

```

vrf definition one
rd 1:2
!
address-family ipv4
  mdt auto-discovery mldp inter-as
  mdt default mpls mldp p2mp
mdt data mpls mldp 100
  mdt overlay use-bgp
  route-target export 1:1
  route-target import 1:1
exit-address-family

```

使用MLDP分区MDT的配置文件

本节介绍配置文件14的配置。

配置文件14配置

以下是配置文件14的PE路由器配置：

```

vrf definition one
rd 1:2
!

```

```

address-family ipv4
  mdt auto-discovery mldp inter-as
  mdt default mpls mldp p2mp
mdt data mpls mldp 100
  mdt overlay use-bgp
  route-target export 1:1
route-target import 1:1
exit-address-family

```

以下是配置文件14的ASBR上的配置：

```

interface Ethernet0/0
ip address 10.3.1.3 255.255.255.0
ip pim sparse-mode
mpls ip
mpls bgp forwarding

```

注意：ASBR之间的链路上需要mpls ip，以便在它们之间具有MLDP邻居关系。

以下是配置文件14的RR上的配置：

```

router bgp 1
bgp log-neighbor-changes
neighbor 10.100.1.1 remote-as 1
neighbor 10.100.1.1 update-source Loopback0
neighbor 10.100.1.3 remote-as 1
neighbor 10.100.1.3 update-source Loopback0
neighbor 10.100.1.8 remote-as 2
neighbor 10.100.1.8 ebgp-multihop 244
neighbor 10.100.1.8 update-source Loopback0
!
address-family ipv4
neighbor 10.100.1.1 activate
neighbor 10.100.1.1 route-reflector-client
neighbor 10.100.1.1 send-label
neighbor 10.100.1.3 activate
neighbor 10.100.1.3 route-reflector-client
neighbor 10.100.1.3 send-label
no neighbor 10.100.1.8 activate
exit-address-family
!
address-family ipv4 mvpn
neighbor 10.100.1.1 activate
neighbor 10.100.1.1 send-community extended
neighbor 10.100.1.1 route-reflector-client
neighbor 10.100.1.8 activate
neighbor 10.100.1.8 send-community extended
exit-address-family
!
address-family vpnv4
neighbor 10.100.1.1 activate
neighbor 10.100.1.1 send-community extended
neighbor 10.100.1.1 route-reflector-client
neighbor 10.100.1.3 activate
neighbor 10.100.1.3 send-community extended
neighbor 10.100.1.3 route-reflector-client
neighbor 10.100.1.8 activate
neighbor 10.100.1.8 send-community extended
neighbor 10.100.1.8 next-hop-unchanged
exit-address-family
!

```

CsC

此信息的提供假设是，路由器上实施了正确的配置，以便运营商的运营商(CsC)MPLS VPN可以为单播运行。

CsC仅支持配置文件0。这意味着，可以使用启用组播的VPN实现分层CsC。CsC的VPN已配置mVPN配置文件0。运营商的网络也配置了mVPN配置文件0。这意味着在CsC的CsC-PE路由器和运营商的PE路由器上有常规的mVPN配置，然后组播不需要其他配置。

验证

当前没有可用于此配置的验证过程。

故障排除

目前没有针对此配置的故障排除信息。