下一代組播 — 預設MDT GRE(BGP AD - PIM C:配置檔案3)

目錄

簡介

本檔案介紹使用VPN進行多點傳送(mVPN)的預設多點傳送分佈樹(MDT)GRE(BGP AD - PIM C)。它使用範例和Cisco IOS中的實作來說明行為。

什麼是預設MDT?

它用於將組播連線到一個VRF中的所有PE。預設表示連線所有PE路由器。預設情況下，它會傳送所有流量。所有PIM控制流量和資料平面流量。範例：(*,G)流量和(S，G)流量。預設為必須設定。此預設MDT連線要連線的所有PE路由器。這表示多點到多點。任何人都可以傳送，每個人都可以從樹接收。

什麼是Data MDT?

它是可選的，而且是按需建立的。它承載特定(S，G)流量。在最新的IOS版本中，閾值配置為0和infinite。每當第一個資料包到達VRF時，都會初始化資料MDT，如果無窮大，則從不建立資料MDT，流量將以預設MDT向前移動。Data MDT始終是接收樹，它們從不傳送任何流量。資料MDT僅用於(S，G)流量。

建立資料MDT的閾值可以針對每個路由器或每個VRF進行配置。當組播傳輸超過定義的閾值時，傳送PE路由器建立資料MDT並向預設MDT上的所有路由器傳送包含資料MDT資訊的使用者資料包協定(UDP)消息。每秒檢查一次用於確定多播流是否超過資料MDT閾值的統計資訊。

附註：PE路由器傳送UDP消息後，會再等待3秒後再進行切換；13秒是最糟糕的切換時間，3秒是最好的切換時間。

僅為VRF組播路由表中的(S，G)組播路由條目建立資料MDT。無論單個源資料速率的值如何，都不會為(*, G)條目建立它們

- 允許PE直接連線MDT的源樹。
- 網路中不需要集結點。
- RP是一個潛在的故障點和額外的開銷。
- 但是它們允許共用和BiDir樹（更少狀態）。
- 減少轉發延遲。
- 避免管理開銷以管理組/RP對映和冗餘RP以實現可靠性。
- 需要更多的狀態權衡取捨。
- (S， G)用於PE中的每個mVPN。

如果有5個PE各自保持mVRF紅色，則有5個x(S， G)條目。

1. 在P路由器和PE路由器上配置ip pim ssm range命令(避免建立不必要的(*, G)條目)。
2. 建議對Data-MDT使用SSM。
3. 如果可能，請對Default-MDT使用BiDir（BiDir支援特定於平台）。

如果SSM未用於設定資料MDT:

- 每個VRF都需要配置一組唯一的多播P地址；同一個MD中的兩個VRF不能配置同一組地址。
- 需要更多的組播P地址。
- 複雜的運營和管理。
- SSM要求PE加入(S， G)而不是(*, G)。

G即已配置，但PE並不直接知道由MP-BGP傳播的預設MDT的S(S， G)值。

SSM的優勢在於它不依賴於使用RP為特定MDT組派生源PE路由器。

源PE和預設MDT組的IP地址通過邊界網關協定(BGP)傳送

BGP有兩種方式可傳送此資訊：

- 延伸社群 思科專有解決方案非傳遞屬性（不適用於inter-AS）
- BGP地址系列MDT SAFI(66) **draft-nalawade-idr-mdt-safi**

  附註：使用MDT SAFI之前支援GRE MVPN;實際上，即使在使用RD型別2使用MDT SAFI之前。技術上，對於配置檔案3，不應配置MDT SAFI，但同時支援兩個SAFI進行遷移。

BGP

- 源PE和MDT預設組以**MP_REACH_NLRI**的NLRI編碼。
- RD與為其配置MDT預設組的MVRF的RD相同。
- RD型別為0或1

```
▼ Path Attribute - MP_REACH_NLRI
  ▶ Flags: 0x80, Optional: Optional, Non-transitive, Complete
    Type Code: MP_REACH_NLRI (14)
    Length: 23
    Address family identifier (AFI): IPv4 (1)
    Subsequent address family identifier (SAFI): MCAST-VPN (5)
    Next hop network address (4 bytes)
    Number of Subnetwork points of attachment (SNPA): 0
  ▼ Network layer reachability information (14 bytes)
      Route Type: Intra-AS I-PMSI A-D route (1)
      Length: 12
▶ Path Attribute - ORIGIN: INCOMPLETE
▶ Path Attribute - AS_PATH: empty
▶ Path Attribute - MULTI_EXIT_DISC: 0
▶ Path Attribute - LOCAL_PREF: 100
▶ Path Attribute - COMMUNITIES: NO_EXPORT
▶ Path Attribute - EXTENDED_COMMUNITIES
▼ Path Attribute - PMSI_TUNNEL_ATTRIBUTE
  ▶ Flags: 0xc0, Optional, Transitive: Optional, Transitive, Complete
    Type Code: PMSI_TUNNEL_ATTRIBUTE (22)
    Length: 13
    Flags: 0
    Tunnel Type: PIM SSM Tree (3)
  ▶ MPLS Label Stack:  (withdrawn)
  ▼ Tunnel ID: < 1.1.1.1, 239.232.0.0 >
      PIM-SSM Tree tunnel Root Node: 1.1.1.1
      PIM-SSM Tree tunnel P-multicast group: 239.232.0.0
```

PMSI屬性包含源地址和組地址。以便形成MT隧道。

SSM組的組播定址

232.0.0.0 - 232.255.255.255已保留給全域性源特定組播應用程式。

239.0.0.0 - 239.255.255.255是管理作用域的IPv4組播地址空間範圍

IPv4組織本地範圍**- 239.192.0.0/14**

區域性範圍是最小封閉範圍，因此不可進一步劃分。

範圍239.0.0.0/10、239.64.0.0/10 和239.128.0.0/10未分配，可用於擴展此空間。

這些範圍應保持未分配狀態，直到239.192.0.0/14空間不足。

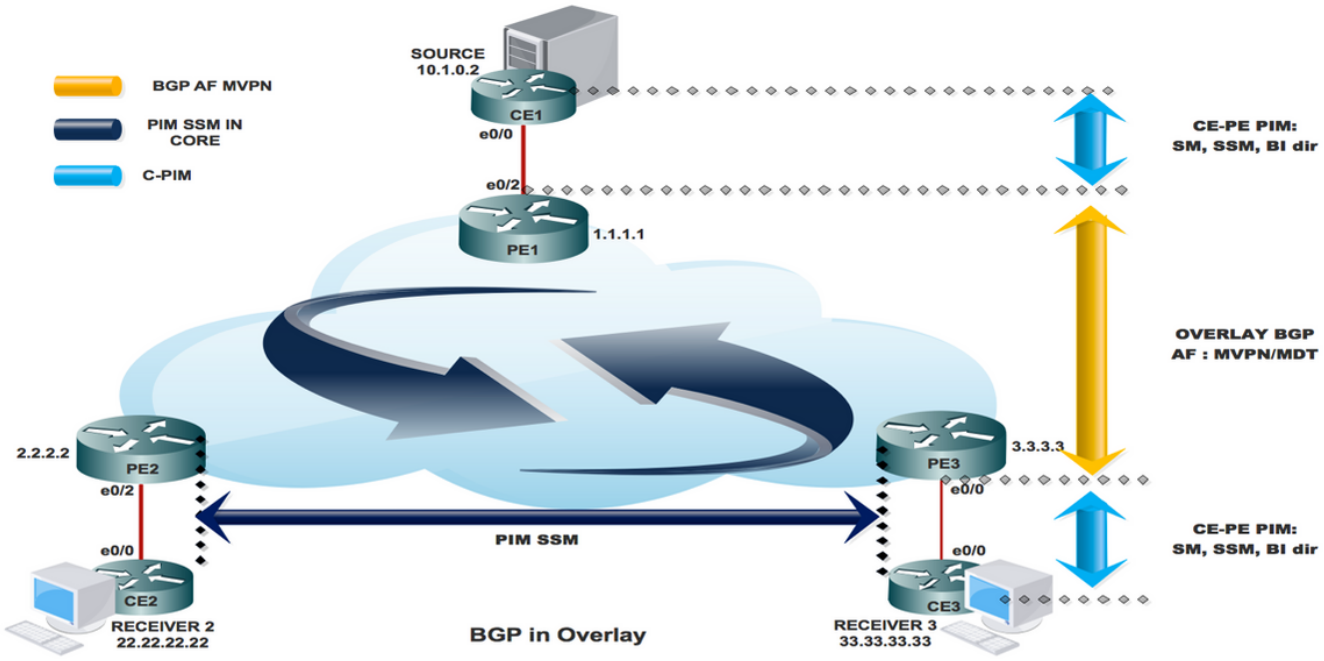
建議

- Default-MDT應該從239/8空間提取地址，從以組織本地範圍239.192.0.0/14定義的範圍開始
- Data-MDT應該從組織本地範圍內提取地址。
- 也可以使用SSM全域性範圍232.0.0.0 - 232.255.255.255
- 由於SSM始終使用唯一的(S， G)狀態，因此不會出現重疊，因為SSM組播流將由不同源（具有不同地址）發起，無論它們位於提供商網路還是更大的網際網路上。
- 在特定組播域（Default-MDT是常見的）中的每個mVRF使用相同的Data-MDT池。

例如，所有使用Default-MDT 239.192.10.1的VRF都應使用相同的Data MDT 239.232.1.0/24範圍

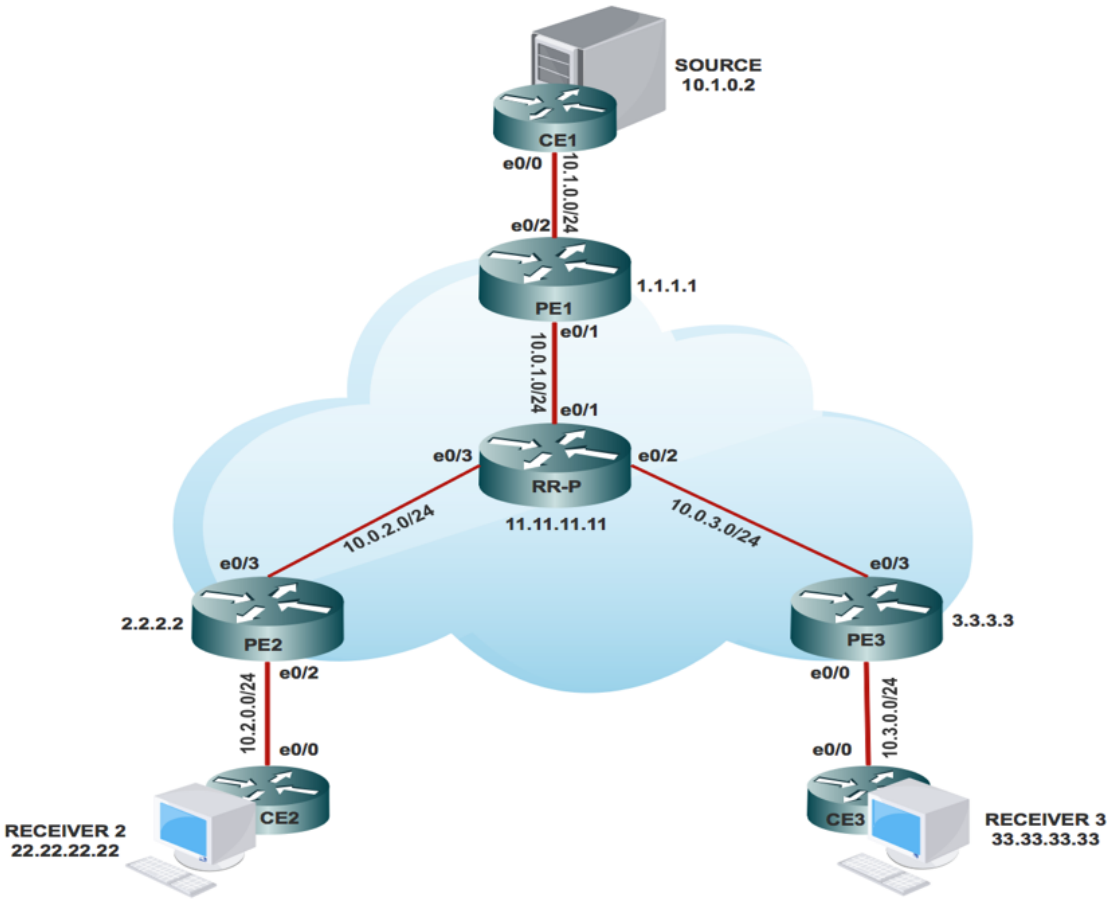
重疊訊號

Rosen GRE的重疊訊號顯示於圖中。



拓撲

Rosen GRE的拓撲如圖所示。



多點傳送VPN路由和轉送以及多點傳送網域

MVPN將組播路由資訊引入到VPN路由和轉發表中。當提供商邊緣(PE)路由器收到來自客戶邊緣(CE)路由器的組播資料或控制資料包時，根據組播VPN路由和轉發例項(MVRF)中的資訊執行轉發。MVPN不使用標籤交換。

可以相互傳送組播流量的一組MVRF構成組播域。例如，如果客戶希望將特定型別的組播流量傳送到所有全域性員工，則該客戶的多播域將包含與該企業關聯的所有CE路由器。

配置任務

1. 在所有節點上啟用組播路由。

2. 在所有介面中啟用協定無關組播(PIM)稀疏模式。

3. 使用現有VRF配置預設MDT。

4. 在介面Ethernet0/x上配置VRF。

5. 在VRF上啟用組播路由。

6. 在核心內部的所有節點中配置PIM SSM Default。

7. 配置BGP地址系列MVPN。

8. 在CE節點中配置BSR RP。

9. 預配置：

```
VRF SSM-BGP
mBGP: Address family VPNv4
VRF Routing Protocol
```

Configuration Steps:

Enable Multicast Routing

On All Nodes

```
(conf) # ip multicast-routing
```

Enable "ip multicast-routing" in global mode on all nodes.

Enable PIM Sparse Mode

Enable on all connected Interface

```
(config)#interface Ethernet0/x
(config-if)#ip pim sparse-mode

(config)# interface lo0
(config-if)# ip pim sparse-mode
```

"x" represents the connected interface number on all nodes

Configure Default MDT Group in VRF

On PE1, PE2 and PE3

```
(config)#ip vrf SSM-BGP
(config-vrf)# mdt auto-discovery pim
(config-vrf)# mdt default 239.232.0.0
```

SERVICE PROVIDER : Group : 239.232.0.0 Source : 1.1.1.1

Configure the VRF on the interface Ethernet0/x

On PE1, PE2 and PE3

```
(config)#interface Ethernet0/x
(config-if)# ip vrf forwarding SSM-BGP
(config-if)# ip address 10.x.0.1 255.255.255.0
(config-if)# ip pim sparse-mode
```

"x" represent the interface number that PE connected to CE.

Enable Multicast Routing on VRF

On PE1, PE2 and PE3

```
(conf) # ip multicast-routing vrf SSM-BGP
```

Enable "ip multicast-routing m-GRE" in global mode.

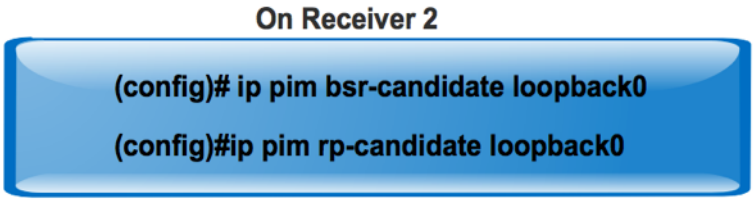
Configure PIM SSM Default in all nodes inside the core.

On PE1, PE2, PE3 and RR-P Node

```
(config) # ip pim ssm default
```

Static RP configuration in the core in global mode.

Configure BSR RP in CE Node (Receiver)



BSR RP configuration in the Receiver 2 in global mode.

驗證

任務1:檢驗物理連線。

驗證所有連線的介面是否為**UP**。

任務2:驗證BGP地址系列VPNv4單播。

- 驗證是否在所有路由器中為AF VPNv4單播啟用BGP，且BGP鄰居為**UP**。
- 確認BGP VPNv4單播表具有所有客戶字首。

任務3:驗證BGP地址系列MVPN單播。

- 驗證是否在所有路由器中為AF IPV4 MVPN啟用了BGP，且BGP鄰居為**UP**。
- 使用Type 1 Route檢驗所有PE發現是否相互發現。

任務4:驗證端到端組播流量。

- 檢查PIM鄰居關係。
- 驗證已在VRF中建立組播狀態。
- 檢驗PE1、PE2和PE3上的mRIB條目。
- 驗證(S， G)mFIB條目，資料包在軟體轉發中遞增。
- 檢驗ICMP資料包是否從CE到達CE。

Task 1: Verify Physical Connectivity

Verify all the connected interface are "UP"

```
#sh ip interface brief
```

Task 2: Verify Address Family VPNv4 unicast

Address Family VPNv4 unicast and BGP neighbors

```
# show running-config | s r bgp
# show bgp vpnv4 unicast summary all
```

VPNv4 unicast table has all the Customer prefixes

```
PE1#sh bgp vpnv4 unicast all

BGP table version is 31, local router ID is 1.1.1.1

     Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 100:100 (default for vrf m-GRE)

 *>i 22.22.22.22/32   2.2.2.2                  0    100      0 20 i
 *>i 33.33.33.33/32   3.3.3.3                  0    100      0 30 i
 *>  111.111.111.111/32
                       10.1.0.2                 0             0 10 i
```

Check on all the PE nodes (PE1, PE2 and PE3)

Task 3: Verify Address Family IPv4 MVPN

Address Family IPv4 MVPN and BGP neighbors

```
# show running-config | s r bgp
# #sh bgp ipv4 mvpn all
```

IPv4 MVPN table has all the PE routes with Type 1 routes

```
PE1#sh bgp ipv4 mvpn all
BGP table version is 15, local router ID is 1.1.1.1

Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 1:1 (default for vrf SSM-BGP)
 *>   [1][1:1][1.1.1.1]/12
                      0.0.0.0                            32768 ?
 *>i  [1][1:1][2.2.2.2]/12
                      2.2.2.2                  0    100      0 ?
 *>i  [1][1:1][3.3.3.3]/12
                      3.3.3.3                  0    100      0 ?
Route Distinguisher: 2:2
 *>i  [1][2:2][2.2.2.2]/12
                      2.2.2.2                  0    100      0 ?
Route Distinguisher: 3:3
     Network          Next Hop            Metric LocPrf Weight Path
 *>i  [1][3:3][3.3.3.3]/12
                      3.3.3.3                  0    100      0 ?
```

Check on all the PE nodes (PE1, PE2 and PE3)

Verify that (S,G) mFIB entry, packet getting incremented

```
PE1#sh ip mfib vrf SSM-BGP 225.1.1.1 verbose

I/O Item Flags:
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept,

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   FS Pkt Count/PS Pkt Count
VRF SSM-BGP
 (10.1.0.2,225.1.1.1) Flags: K DDE
   SW Forwarding: 10/0/100/0, Other: 2/1/1
   Ethernet0/2 Flags: RA A MA
   Tunnel0, MDT/239.232.0.0 Flags: RF F NS
     CEF: Adjacency with MAC: 4500000000000000FF2FC9E401010101EFE8000000000800
     Pkts: 10/0
```

Verify that multicast state is created in the VRF

```
PE1#sh ip mroute vrf SSM-BGP verbose
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, p - PIM Joins on route,


(10.1.0.2, 225.1.1.1), 00:00:03/00:02:56, flags: Tp
  Incoming interface: Ethernet0/2, RPF nbr 10.1.0.2
  Outgoing interface list:
    Tunnel0, GRE MDT: 239.232.0.0 (default), Forward/Sparse, 00:00:03/00:03:26, p
```

Check on all the PE nodes (PE1, PE2 and PE3)

Verify that (S,G) mFIB entry, packet getting incremented

```
PE1#sh ip mfib vrf SSM-BGP 225.1.1.1 verbose

I/O Item Flags:
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept,

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   FS Pkt Count/PS Pkt Count
VRF SSM-BGP
 (10.1.0.2,225.1.1.1) Flags: K DDE
   SW Forwarding: 10/0/100/0, Other: 2/1/1
   Ethernet0/2 Flags: RA A MA
   Tunnel0, MDT/239.232.0.0 Flags: RF F NS
     CEF: Adjacency with MAC: 4500000000000000FF2FC9E401010101EFE8000000000800
     Pkts: 10/0
```

mRIB in the Service Provider Core.

```
PE1#sh ip mroute verbose
IP Multicast Routing Table
Flags: s - SSM Group, C - Connected,
       T - SPT-bit set,
       I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,
       p - PIM Joins on route,

(1.1.1.1, 239.232.0.0), 01:00:33/00:03:03, flags: sTp
  Incoming interface: Loopback0, RPF nbr 0.0.0.0
  Outgoing interface list:
    Ethernet0/1, Forward/Sparse, 01:00:33/00:03:03, p

(3.3.3.3, 239.232.0.0), 01:00:33/stopped, flags: sTIZ
  Incoming interface: Ethernet0/1, RPF nbr 10.0.1.2
  Outgoing interface list:
    MVRF SSM-BGP, Forward/Sparse, 01:00:33/00:02:26

(2.2.2.2, 239.232.0.0), 01:00:33/stopped, flags: sTIZ
  Incoming interface: Ethernet0/1, RPF nbr 10.0.1.2
  Outgoing interface list:
    MVRF SSM-BGP, Forward/Sparse, 01:00:33/00:02:26
```

Check on all the PE nodes (PE1, PE2 and PE3)

Verify ICMP packets getting reach from CE to CE

```
SOURCE1#ping 225.1.1.1
Type escape sequence to abort.
Sending 1, 100-byte ICMP Echos to 225.1.1.1, timeout is 2 seconds:

Reply to request 0 from 10.3.0.2, 29 ms
Reply to request 0 from 10.3.0.2, 29 ms
```

如何建立通道介面？

MDT隧道建立

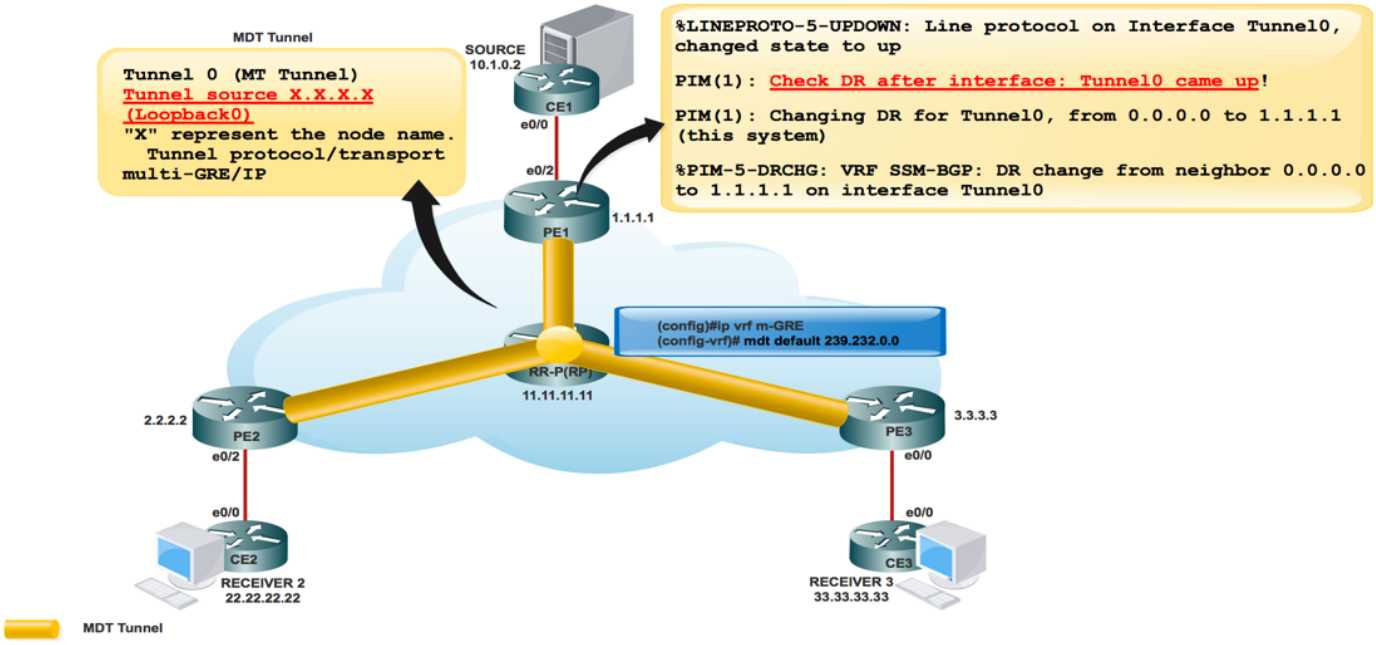
配置mdt default 239.232.0.0之後

通道0啟動，並分配其Loopback 0地址作為源。

%LINEPROTO-5-UPDOWN:介面Tunnel0上的線路協定，狀態更改為up

```
PIM(1): Check DR after interface: Tunnel0 came up!
PIM(1): Changing DR for Tunnel0, from 0.0.0.0 to 1.1.1.1 (this system)
%PIM-5-DRCHG: VRF SSM-BGP: DR change from neighbor 0.0.0.0 to 1.1.1.1 on interface Tunnel0
```

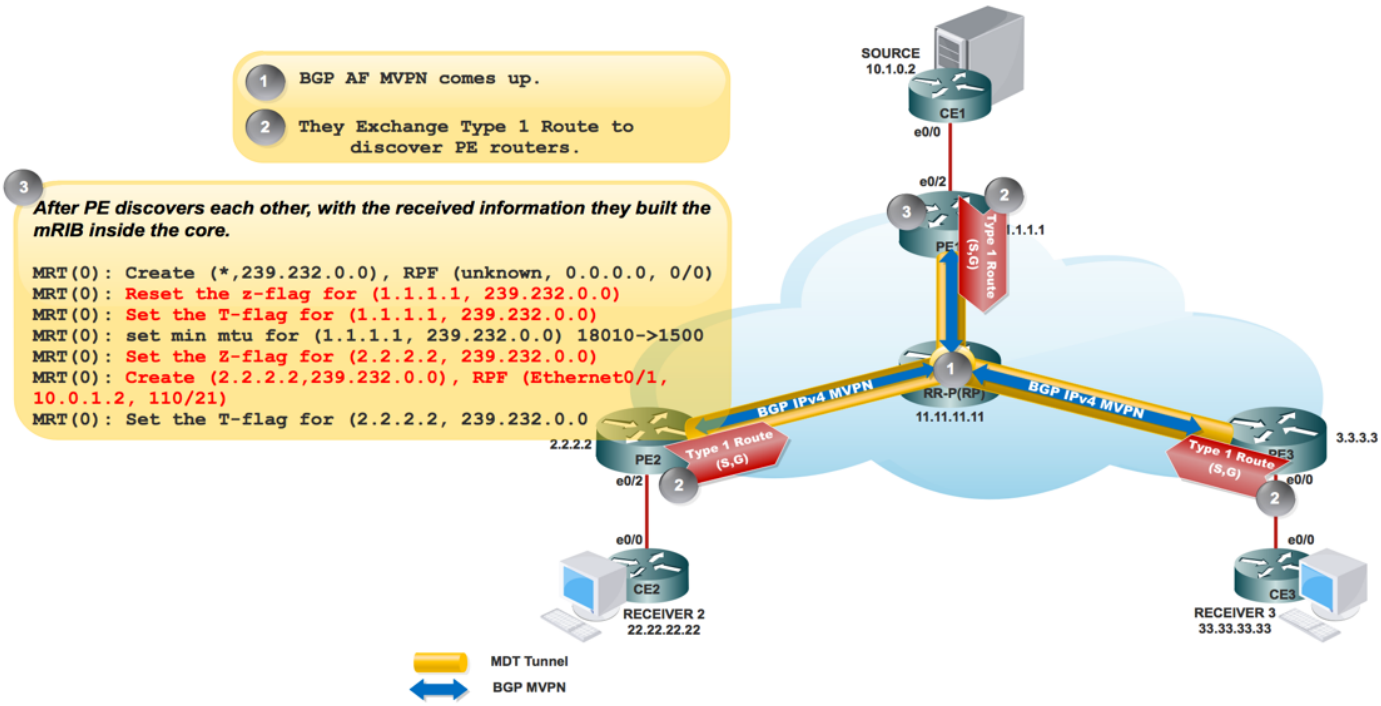
此圖顯示MDT隧道建立。




```
PE1#sh int tunnel 0
Tunnel0 is up, line protocol is up
  Hardware is Tunnel
  Interface is unnumbered. Using address of Loopback0 (1.1.1.1)
  MTU 17916 bytes, BW 100 Kbit/sec, DLY 50000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation TUNNEL, loopback not set
  Keepalive not set
  Tunnel source 1.1.1.1 (Loopback0)
   Tunnel Subblocks:
      src-track:
         Tunnel0 source tracking subblock associated with Loopback0
          Set of tunnels with source Loopback0, 1 member (includes iterators), on interface <OK>
  Tunnel protocol/transport multi-GRE/IP
    Key disabled, sequencing disabled
    Checksumming of packets disabled
```

一旦BGP MVPN啟動，所有PE便通過型別1路由發現彼此。已形成組播隧道。BGP在PMSI屬性中攜帶所有組和源PE地址。

此圖顯示1類交換路由。



此圖顯示PCAP-1。

```
▼ Path attributes
  ▼ Path Attribute – MP_REACH_NLRI
    ▶ Flags: 0x80, Optional: Optional, Non-transitive, Complete
      Type Code: MP_REACH_NLRI (14)
      Length: 23
      Address family identifier (AFI): IPv4 (1)
      Subsequent address family identifier (SAFI): MCAST-VPN (5)
      Next hop network address (4 bytes)
      Number of Subnetwork points of attachment (SNPA): 0
    ▼ Network layer reachability information (14 bytes)
        Route Type: Intra-AS I-PMSI A-D route (1)  ──►  Type 1 Route
        Length: 12
  ▶ Path Attribute – ORIGIN: INCOMPLETE
  ▶ Path Attribute – AS_PATH: empty
  ▶ Path Attribute – MULTI_EXIT_DISC: 0
  ▶ Path Attribute – LOCAL_PREF: 100
  ▶ Path Attribute – COMMUNITIES: NO_EXPORT
  ▶ Path Attribute – EXTENDED_COMMUNITIES
  ▼ Path Attribute – PMSI_TUNNEL_ATTRIBUTE
    ▶ Flags: 0xc0, Optional, Transitive: Optional, Transitive, Complete
      Type Code: PMSI_TUNNEL_ATTRIBUTE (22)
      Length: 13
      Flags: 0
      Tunnel Type: PIM SSM Tree (3)  ──►  PIM SSM TREE (Tunnel Type)
    ▶ MPLS Label Stack:  (withdrawn)
    ▼ Tunnel ID: < 1.1.1.1, 239.232.0.0 >
        PIM-SSM Tree tunnel Root Node: 1.1.1.1
        PIM-SSM Tree tunnel P-multicast group: 239.232.0.0  ◄──►  PIM SSM Tree Tunnel Root and Group
```

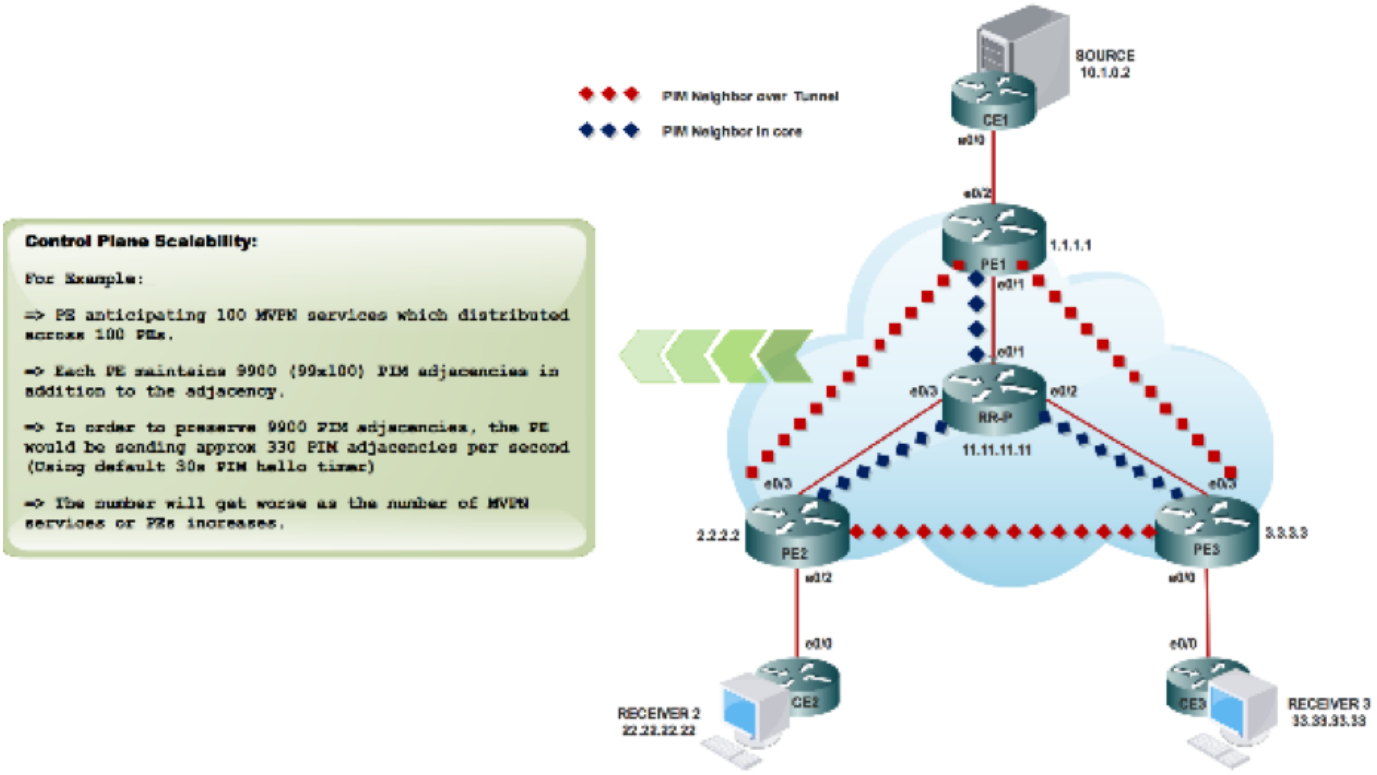
```
PE1#sh ip mroute
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,

 (3.3.3.3, 239.232.0.0), 00:01:41/00:01:18, flags: sTIZ
  Incoming interface: Ethernet0/1, RPF nbr 10.0.1.2
  Outgoing interface list:
    MVRF SSM-BGP, Forward/Sparse, 00:01:41/00:01:18

(2.2.2.2, 239.232.0.0), 00:01:41/00:01:18, flags: sTIZ
  Incoming interface: Ethernet0/1, RPF nbr 10.0.1.2
```

```
  Outgoing interface list:
    MVRF SSM-BGP, Forward/Sparse, 00:01:41/00:01:18
```

“Z” Multicast Tunnel formed after BGP mVPN comes up, as it advertises the Source PE and Group Address in PMSI attribute.

PIM鄰居關係

```
PE1#sh ip pim vrf SSM-BGP neighbor
PIM Neighbor Table
Mode: B - Bidir Capable, DR - Designated Router, N - Default DR Priority,
      P - Proxy Capable, S - State Refresh Capable, G - GenID Capable
Neighbor          Interface                Uptime/Expires    Ver   DR
Address                                                            Prio/Mode
10.1.0.2          Ethernet0/2           00:58:18/00:01:31 v2  1 / DR S P G
3.3.3.3           Tunnel0                00:27:44/00:01:32 v2    1 / S P G
2.2.2.2           Tunnel0                00:27:44/00:01:34 v2    1 / S P G
```



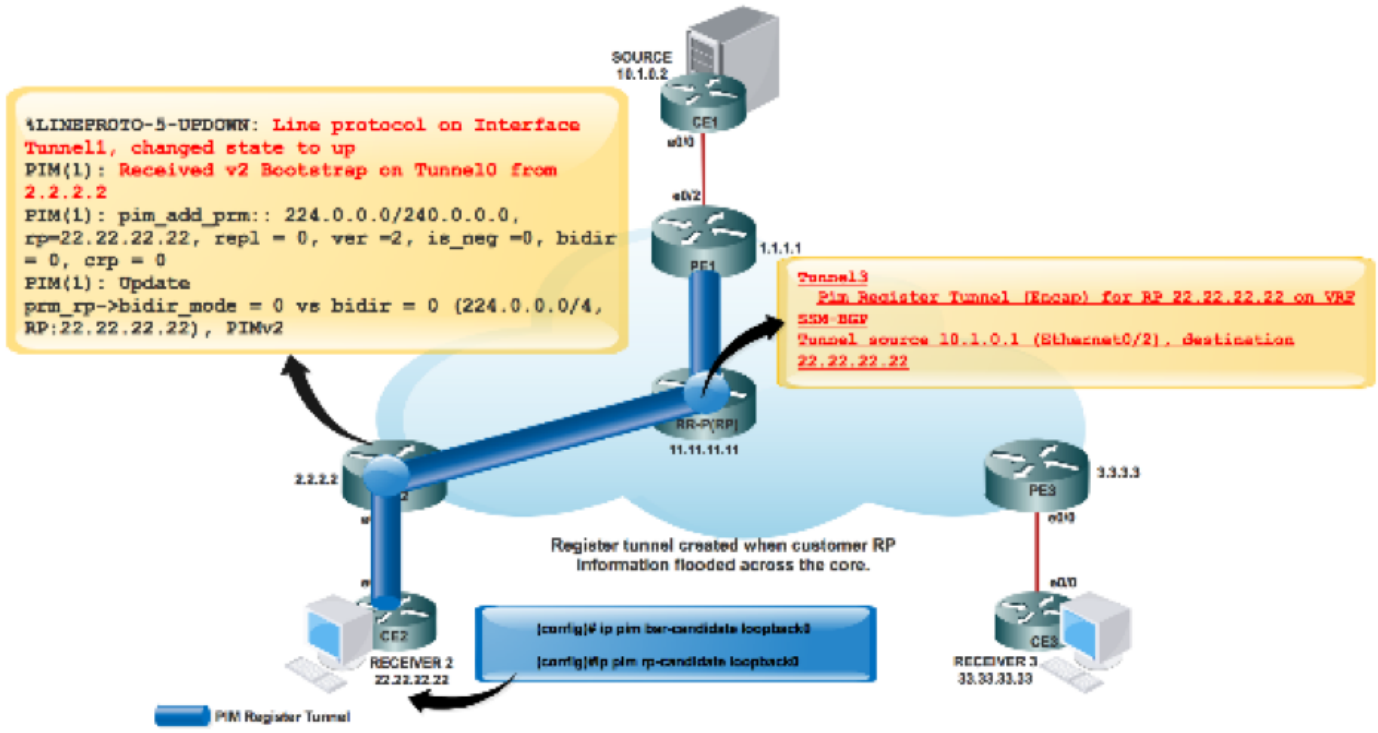
配置RP資訊後：

%LINEPROTO-5-UPDOWN:**介面Tunnel1上的線路協定，狀態更改為up**

通過MDT隧道進行載入程式消息交換

```
PIM(1): Received v2 Bootstrap on Tunnel0 from 2.2.2.2
PIM(1): pim_add_prm:: 224.0.0.0/240.0.0.0, rp=22.22.22.22, repl = 0, ver =2, is_neg =0, bidir =
0, crp = 0
PIM(1): Update
prm_rp->bidir_mode = 0 vs bidir = 0 (224.0.0.0/4, RP:22.22.22.22), PIMv2
*May 18 10:28:42.764: PIM(1): Received RP-Reachable on Tunnel0 from 22.22.22.22
```

此圖顯示了通過MDT隧道進行的載入程式消息交換。




```
PE2#sh int tunnel 1
Tunnel1 is up, line protocol is up
  Hardware is Tunnel
  Description: Pim Register Tunnel (Encap) for RP 22.22.22.22 on VRF SSM-BGP
  Interface is unnumbered. Using address of Ethernet0/2 (10.2.0.1)
  MTU 17912 bytes, BW 100 Kbit/sec, DLY 50000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation TUNNEL, loopback not set
  Keepalive not set
  Tunnel source 10.2.0.1 (Ethernet0/2), destination 22.22.22.22
   Tunnel Subblocks:
      src-track:
         Tunnel1 source tracking subblock associated with Ethernet0/2
          Set of tunnels with source Ethernet0/2, 1 member (includes iterators), on interface
<OK>
  Tunnel protocol/transport PIM/IPv4
  Tunnel TOS/Traffic Class 0xC0,  Tunnel TTL 255
  Tunnel transport MTU 1472 bytes
  Tunnel is transmit only
```

兩個隧道形成PIM暫存器隧道和MDT隧道。

- 隧道0用於傳送PIM加入和低頻寬組播流量。
- 隧道1用於傳送PIM封裝的註冊消息。

要檢查的命令：

**MDT BGP:

PE1#sh ip pim vrf m-SSM mdt bgp

**傳送資料FHR:

PE1#sh ip pim vrf m-SSM mdt

Flag	Name	Description
Z	Multicast Tunnel	Indicates that this entry is an IP multicast group that belongs to the Default or Data MDT tunnel. All packets received for this IP multicast state are sent to the MDT tunnel for decapsulation . Set on receiving PE. Global mulitcast routing table
Y	Joined MDT-data group	Indicates that the traffic was received through a Data MDT tunnel that was set up specifically for this source and group. MVRF multicast routing table
z	MDT-data group sender	Set on sending PE. Global mulitcast routing table
y	Sending to MDT-data group	Indicates that the traffic was sent through a Data MDT tunnel that was set up specifically for this source and group. MVRF multicast routing table
V	RD & Vector	
v	Vecor	
E	Extranet source mroute entry	Indicates that a (*, G) or (S, G) entry in the VRF routing table is a source Multicast VRF (MVRF) entry and has extranet receiver MVRF entries linked to it

相關資訊

- https://tools.ietf.org/html/rfc4760
- https://tools.ietf.org/html/rfc5110
- https://tools.ietf.org/html/rfc6513
- 技術支援與文件 - Cisco Systems