



テナント ルーテッド マルチキャストの設定

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テナント ルーテッド マルチキャストの制約事項

- レイヤ 2 テナント ルーテッド マルチキャスト (TRM) はサポートされていません。レイヤ 3 TRM のみがサポートされています。
- TRM は、外部 MVPN ネットワークへのハンドオフに、デフォルトのマルチキャスト配信ツリー (MDT) のみを使用します。
- アンダーレイネットワークでは、デフォルト MDT は PIM スパースモードのみをサポートし、データ MDT は PIM スパースモードと PIM 送信元特定マルチキャスト (SSM) モードをサポートします。



(注) スパインスイッチはランデブーポイント (RP) として設定できません。アンダーレイネットワークの RP は、PIM ブートストラップルータ (BSR) または自動 RP を使用して選択することもできません。

- TRM はホストのデュアルホーミングをサポートしていません。
- TRM データ MDT は、PIM スパースモードの TRM および IPv4 接続用の PIM 送信元特定モードの TRM のみをサポートします。

- TRM は IPv4 C マルチキャストフローのみをサポートします。
- TRM データ MDT は、IPv4 マルチキャストフローに対してのみレートベースのスイッチオーバーをサポートします。
- TRM データ MDT は、レイヤ2、IP、および VRF-Lite ハンドオフのみをサポートします。

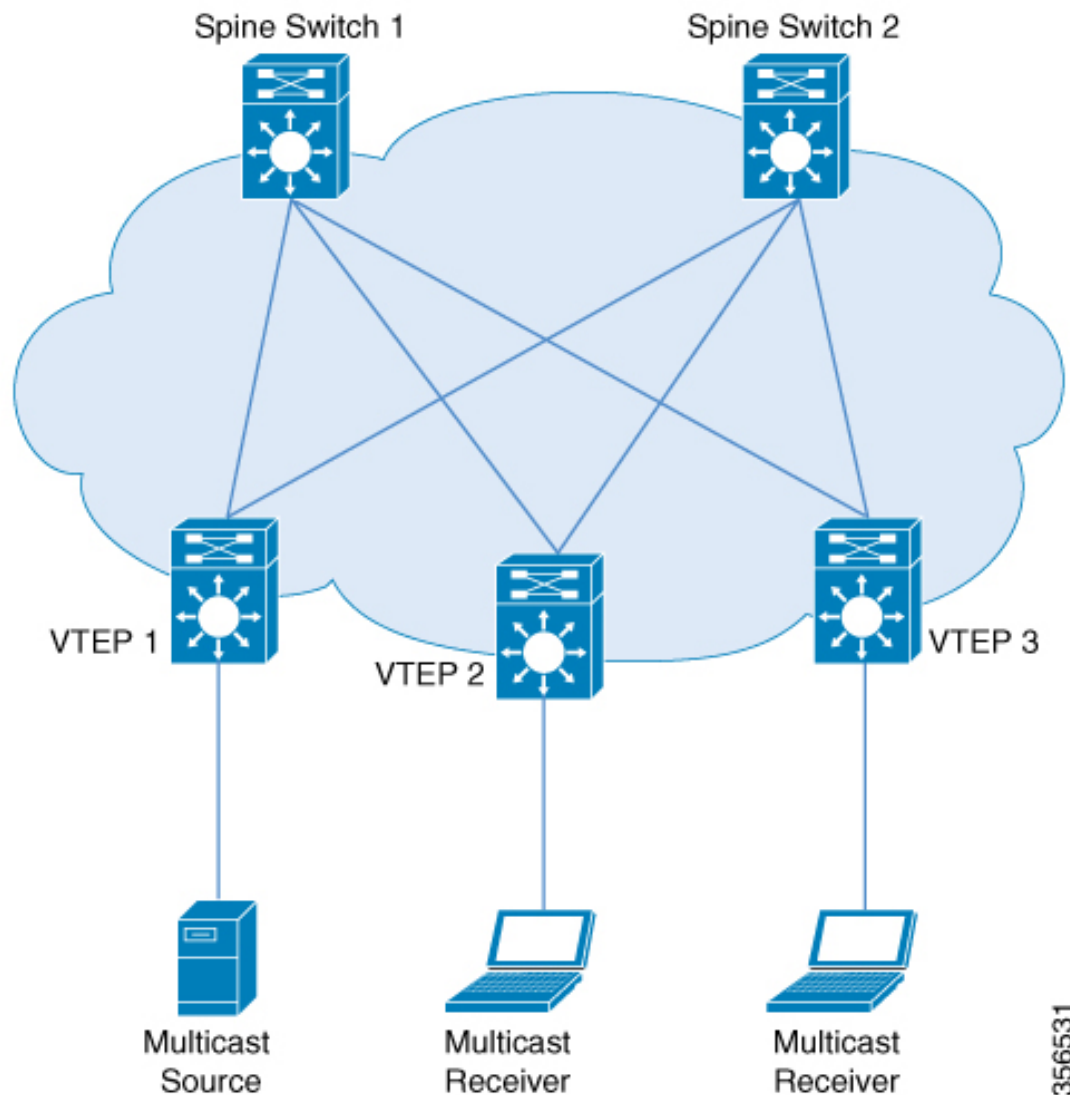
テナントルーテッドマルチキャストについて

TRM は、BGP ベースの EVPN コントロールプレーンを使用する VXLAN ファブリック内でのマルチキャスト転送を有効にします。TRM は、ローカルまたは VTEP 間で同じサブネット内または異なるサブネット内の送信元と受信側の間にマルチテナント対応のマルチキャスト転送を実装します。

TRM は、効率的かつ復元力のある方法で、マルチテナントファブリック内で顧客の IP マルチキャストトラフィックを配布できるようにします。TRM の配布により、ネットワーク内のレイヤ3 オーバーレイマルチキャスト機能が向上します。TRM を有効にすると、アンダーレイでのマルチキャスト転送が活用され、VXLAN でカプセル化されたルーテッドマルチキャストトラフィックが複製されます。デフォルトの MDT は VRF ごとに構築されます。これは、レイヤ2 仮想ネットワークインスタンス (VNI) のブロードキャストおよび不明ユニキャストトラフィック、およびレイヤ2マルチキャスト複製グループの既存のマルチキャストグループに追加されます。オーバーレイ内の個々のマルチキャストグループアドレスは、複製および転送のためにそれぞれのアンダーレイマルチキャストアドレスにマッピングされます。BGP ベースのアプローチを使用する利点は、TRM を備えた BGP EVPN VXLAN ファブリックが、すべてのエッジデバイスまたは VTEP に RP が存在する完全な分散型オーバーレイランデブーポイント (RP) として動作できることです。

マルチキャスト対応のデータセンターファブリックは、通常、マルチキャストネットワーク全体の一部です。マルチキャスト送信元、受信側、およびマルチキャストランデブーポイントはデータセンター内に存在する可能性があります。キャンパス内にある場合や WAN 経由で外部から到達可能である場合もあります。したがって、TRM を使用すると、新しいエンタープライズファブリックと既存のマルチキャストネットワークをシームレスに統合できます。

図 1:テナントルーテッドマルチキャスト トポロジ



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IPv4 および IPv6 のマルチキャストトラフィックの場合、TRM は BGP EVPN およびマルチキャスト仮想プライベートネットワーク (MVPN) ルートを使用してマルチキャストルーティングを実行します。ネットワーク内のすべての VTEP が BGP ピアである必要はありません。ルートリフレクタとして機能するスパインスイッチを使用して、VTEP とスパインスイッチ間に BGP ピアリングを設定できます。送信元到達可能性は、ファブリック内の EVPN ルートタイプ 2 および EVPN ルートタイプ 5 を介して配布されます。RPF は、これらのルートに基づいてインストールされます。source-active と receiver-join 情報は、ルートタイプ 5、6、および 7 を使用して MVPN アドレスファミリーで伝送されます。

EVPN VXLAN ネットワークでは、PIM スパースモードと PIM Source Specific Multicast (SSM) モードのオーバーレイネットワークで TRM がサポートされます。TRM のルートを交換するた

めに、VTEP には MVPN だけでなく EVPN のアドレスファミリーでの BGP ピアリングがあります。

PIM スパースモードの TRM

PIM-SMは、共有ツリー上のデータパケットを転送することによって、アクティブな送信元に関する情報を配布します。PIM-SMは共有ツリーを使用するため、ランデブーポイント（RP）を使用する必要があります。RPは送信元と受信側間のマルチキャストトラフィックの初期コンバージェンスに使用されます。

次の項では、PIM スパースモードで TRM に RP を設定するさまざまな方法について説明します。

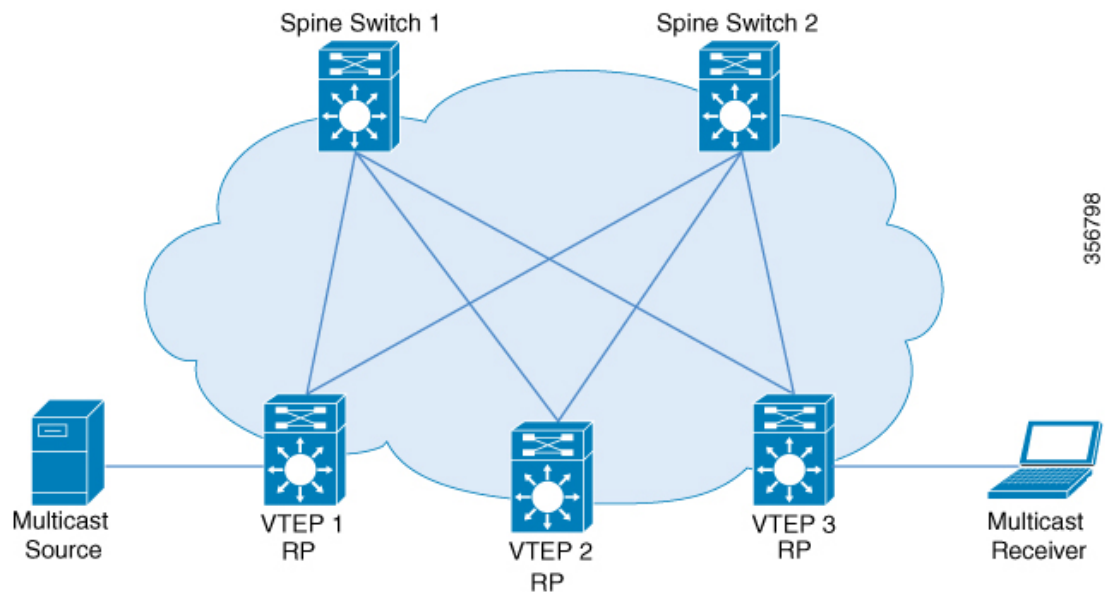
RP の配置

PIM スパースモードの TRM の場合、オーバーレイ RP は BGP EVPN VXLAN ファブリック内またはファブリックの外部で設定できます。

オーバーレイネットワークのエニーキャスト RP

オーバーレイネットワークのエニーキャスト RP では、すべての VTEP が RP として機能します。

図 2: オーバーレイネットワークのエニーキャスト RP



BGP EVPN VXLAN ファブリックの内部の RP

すべての送信元と受信側が EVPN VXLAN ネットワーク内にある TRM のシナリオでは、オーバーレイ RP をボードースパインまたは VTEP に配置できます。

図 3: RP としてのボードースパインスイッチ

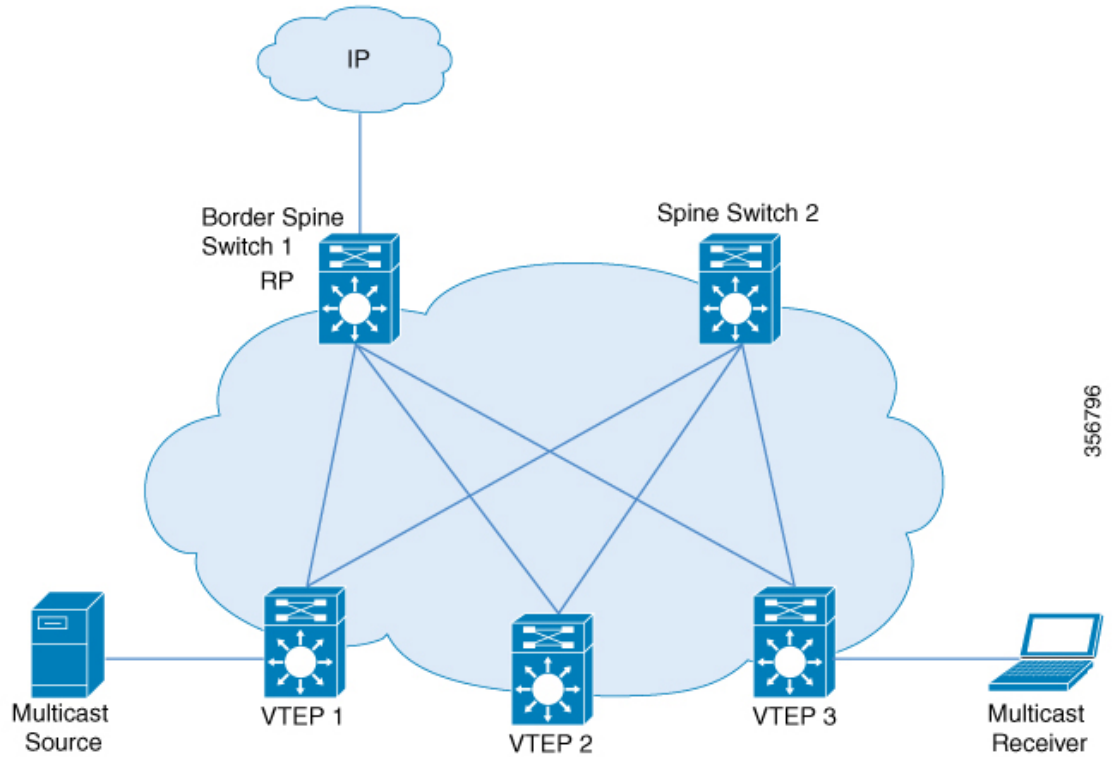
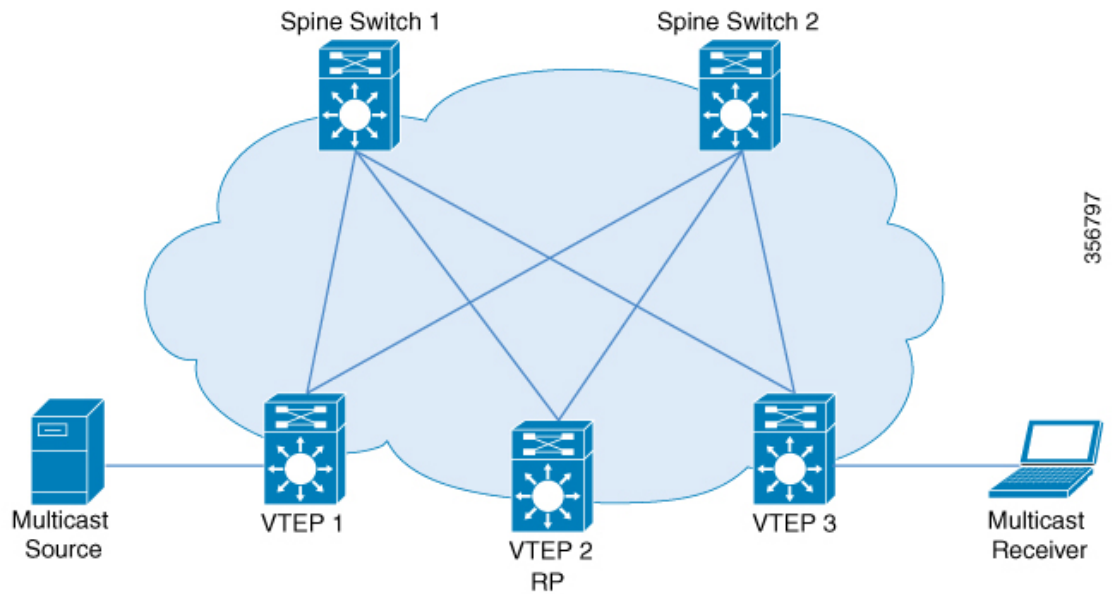


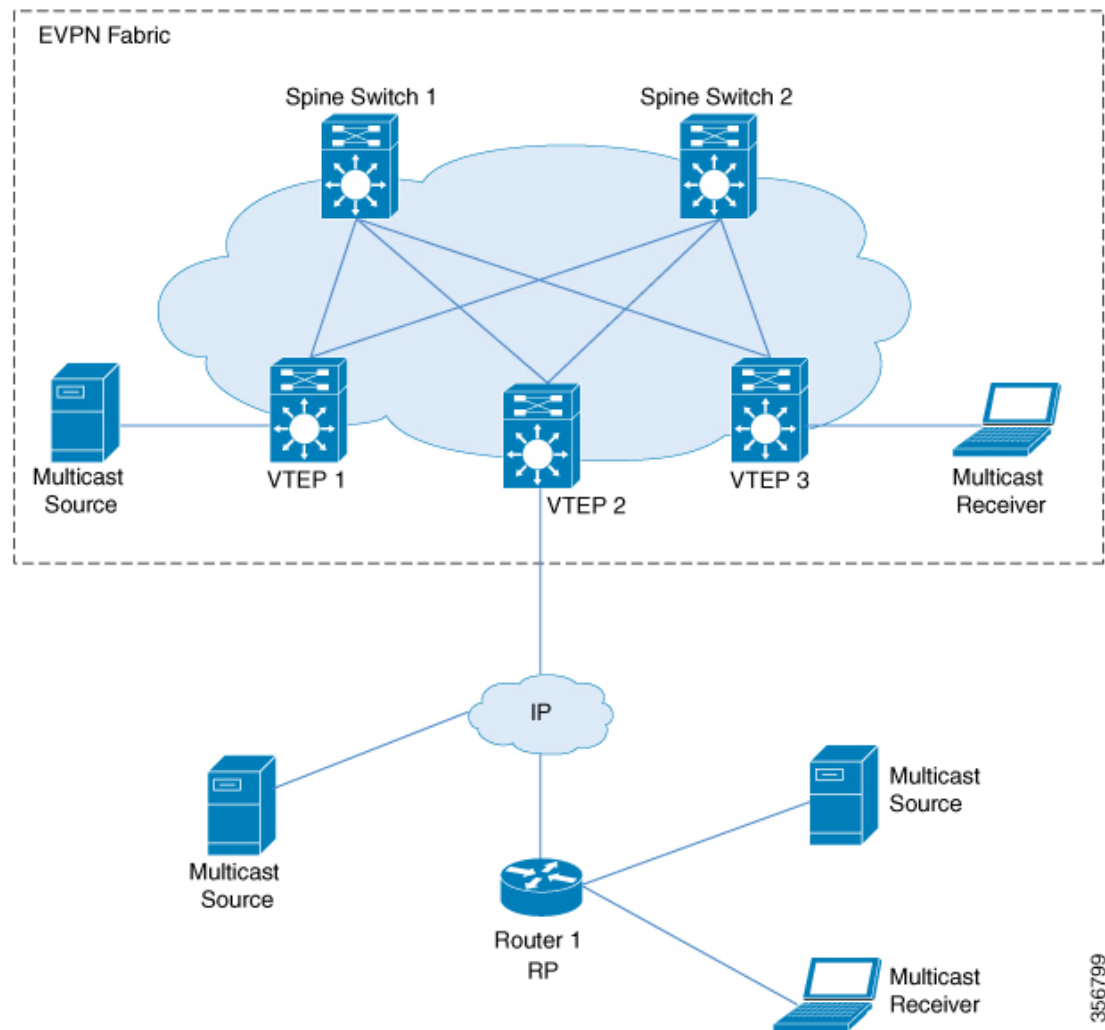
図 4: RP としての VTEP



BGP EVPN VXLAN ファブリックの外部にある RP

送信元と受信側がオーバーレイネットワークおよびEVPN VXLAN ネットワークと連動する必要がある TRM のシナリオでは、VTEP に接続された外部ルータに RP を配置できます。

図 5: BGP EVPN VXLAN ファブリックの外部にある RP



PIM スパースモードでは、RP の設定方法に応じて、TRM を 3 つの異なる方法で設定できます。

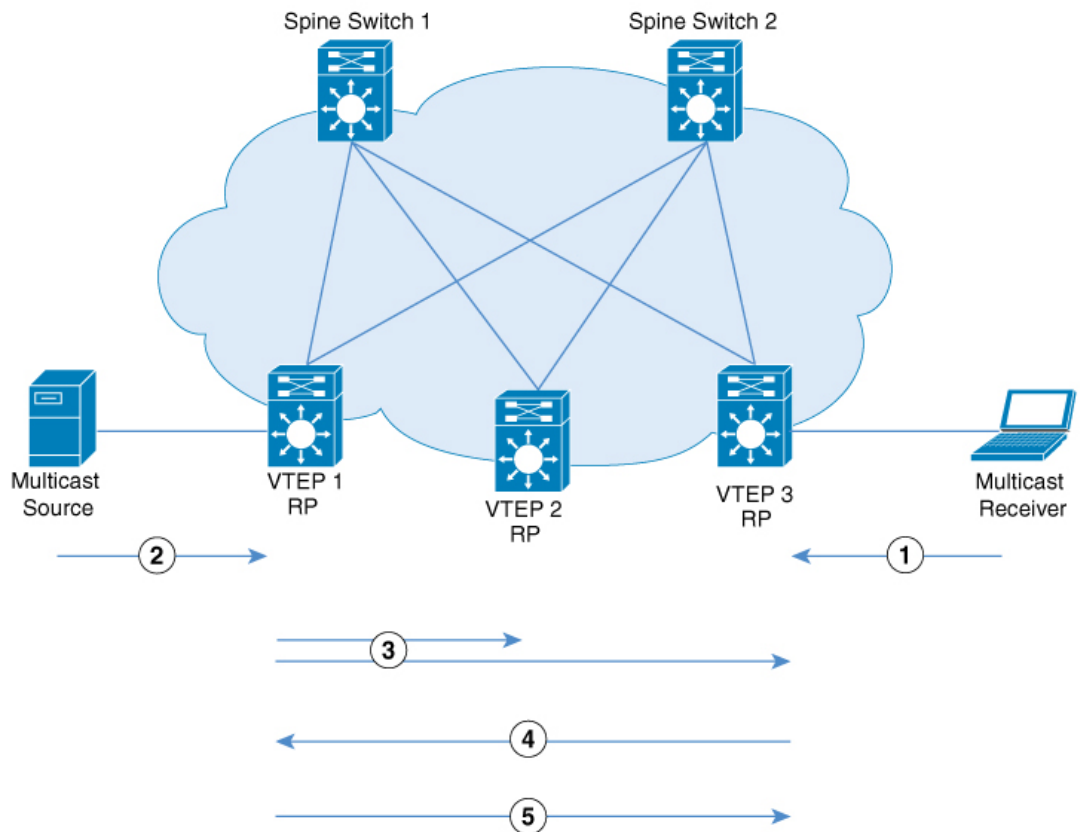
- エニーキャスト RP を使用した PIM スパースモード
- BGP EVPN VXLAN ファブリック内の RP を使用した PIM スパースモード
- BGP EVPN VXLAN ファブリックの外部にある RP での PIM スパースモード

エニーキャスト RP を使用した PIM スパースモード

エニーキャスト RP を使用する PIM スパースモードでは、EVPN VXLAN ネットワーク内のすべての VTEP が、それぞれのマルチキャストグループのオーバーレイネットワーク内で RP として機能します。アンダーレイネットワークの RP は、スパインスイッチで設定する必要があります。

VTEP は送信元デバイスを検出すると、送信元 A-D ルート (MVPN ルートタイプ 5) を他のすべての VTEP に送信します。これらの送信元 A-D ルートに基づいて、他の VTEP は (S,G) join 要求を MVPN ルートタイプ 7 として送信元 VTEP に送信します。

図 6: エニーキャスト RP を使用した PIM スパースモード



エニーキャスト RP を使用する PIM スパースモードでは、次の一連のイベントが発生します。

1. 受信側は VTEP 3 に (*,G) IGMP join を送信します。VTEP 3 は RP であるため、(*,G) は VTEP 3 で作成されます。
2. 送信元デバイスがデータのストリーミングを開始し、(S,G) が VTEP 1 に作成されます。
3. VTEP 1 は RP でもあるため、送信元の自己登録を実行します。

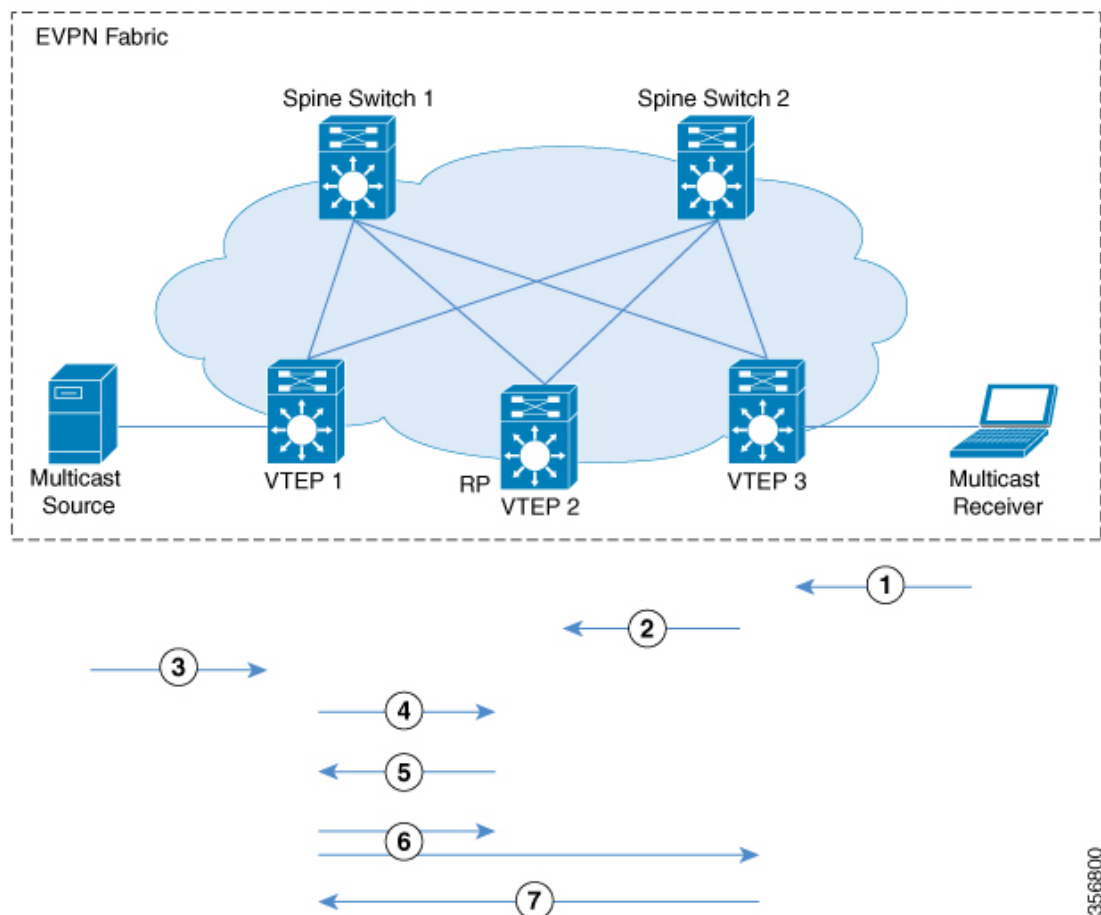
送信元 VTEP (VTEP 1) は (S,G) の送信元 A-D ルート (MVPN ルートタイプ 5 と呼ばれる) を、MVPN アドレスファミリの BGP ピアである他のすべての VTEP にアドバタイズします。

4. VTEP 2 および VTEP 3 は (S,G) の送信元 A-D ルートを受信してインストールします。
(S,G) は VTEP 3 で作成されます。これで VTEP 3 には (S,G) のオーバーレイルートが備わり、EVPN コントロールプレーンから送信元デバイスへのユニキャストルートも備わります。次に、MVPN ルートタイプ 7 (S,G) BGP join を VTEP 1 に送信し、トラフィックの受け入れを開始します。
5. VTEP 1 は、VTEP 3 から MVPN ルートタイプ 7 を受信してインストールします。レイヤ 3 VNI の SVI を (S,G) の転送インターフェイスとして使用し、トラフィックの転送を開始します。

BGP EVPN VXLAN ファブリック内の RP を使用した PIM スパースモード

BGP EVPN VXLAN ファブリック内の RP を使用する PIM スパースモードでは、RP を EVPN VXLAN ネットワーク内の任意の VTEP にすることができます。

図 7: BGP EVPN VXLAN ファブリック内の RP を使用した PIM スパースモード



ファブリック内の RP で TRM が PIM スパースモードで有効になっている場合、次の一連のイベントが発生します。

1. 受信側は VTEP 3 に (*,G) IGMP join を送信します。(*,G) は VTEP 3 で作成されます。
2. VTEP 3 は MVPN ルートタイプ 6 を RP である VTEP 2 に送信します。(*,G) は VTEP 2 で作成されます。
3. 送信元デバイスがデータのストリーミングを開始し、(S,G) が VTEP 1 に作成されます。
4. VTEP 1 は RP であるため、VTEP 2 で送信元登録を実行します。(S,G) は VTEP 2 で作成されます。
5. RP には (S,G) の受信側があるため、MVPN ルートタイプ 7 を VTEP 1 に送信し、PIM 登録トラフィックを (*,G) ツリーの受信側に転送します。
6. VTEP 1 は、VTEP 2 から MVPN ルートタイプ 7 を受信してインストールします。レイヤ 3 VNI の SVI を (S,G) の転送インターフェイスとして使用します。

送信元 VTEP (VTEP 1) は、(S,G) の送信元 A-D ルートを、MVPN アドレスファミリの BGP ピアである他のすべての VTEP にアドバタイズします。

VTEP 2 および VTEP 3 は、(S,G) の送信元 A-D ルートを受信してインストールします。

7. (S,G) は VTEP 3 で作成されます。これで VTEP 3 には (S,G) のオーバーレイルートが備わり、EVPN コントロールプレーンから送信元デバイスへのユニキャストルートも備わります。次に、MVPN ルートタイプ 7 を VTEP 1 に送信し、トラフィックの受け入れを開始します。

VTEP 1 は、VTEP 3 から MVPN ルートタイプ 7 を受信してインストールし、トラフィックの転送を開始します。



- (注) 受信側 VTEP が送信元 VTEP に MVPN ルートタイプ 7 を送信できるようにするために、次の 2 つのトリガーがあります。

- RP から受信側 VTEP に転送される (*,G) パケット。
- 送信元 VTEP から受信した送信元 A-D ルート。

これらのいずれかを受信すると、受信側 VTEP は MVPN ルートタイプ 7 を送信元 VTEP に送信します。

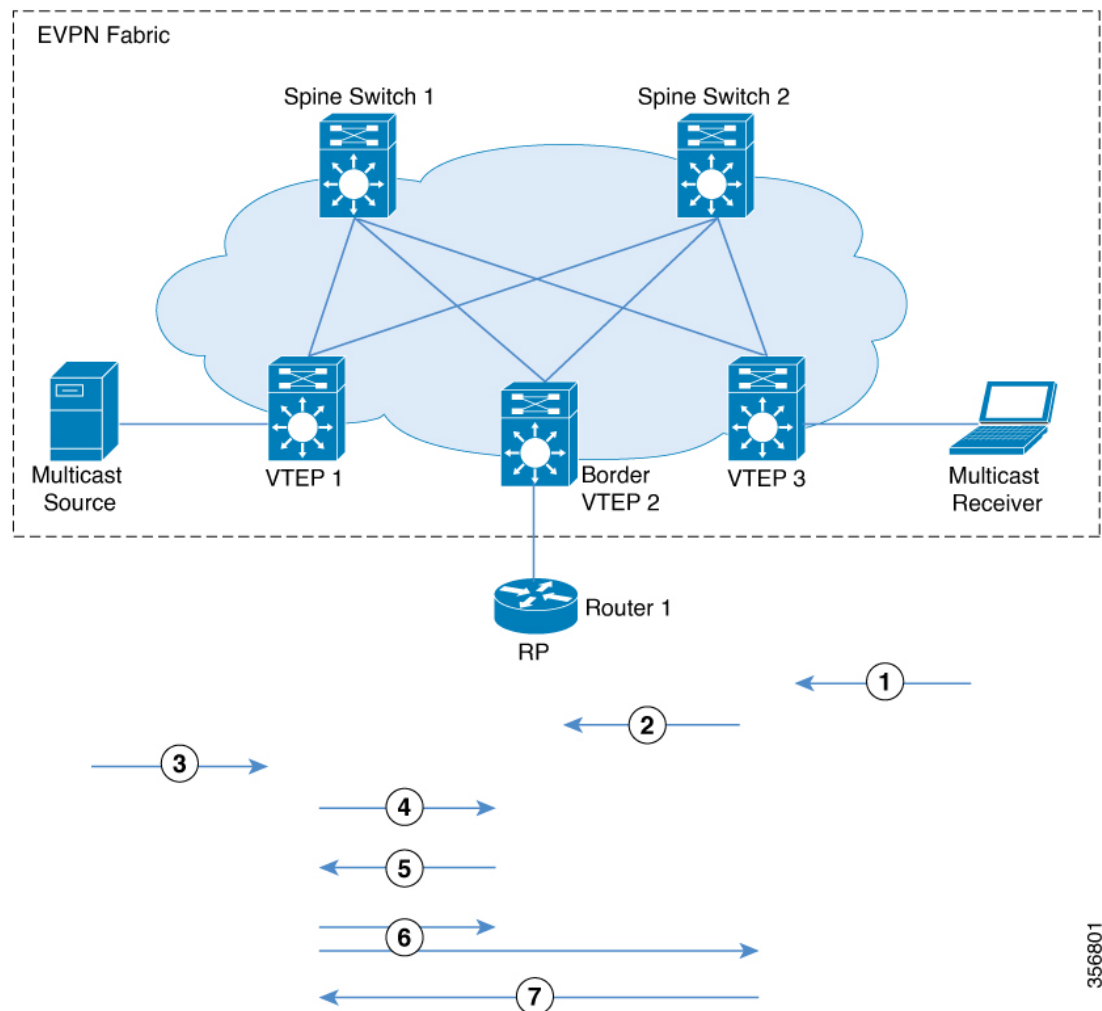
BGP EVPN VXLAN ファブリックの外部にある RP での PIM スパースモード

BGP EVPN VXLAN ファブリックの外部にある RP を使用する PIM スパースモードでは、RP を EVPN VXLAN ネットワーク内の任意の VTEP の背後にある PIM ルータにすることができます。



- (注) RP が BGP EVPN VXLAN ファブリックの外部に設定されている場合、PIM スパースモードの TRM は RP がファブリック内にある場合と同じように機能します。

図 8: BGP EVPN VXLAN ファブリックの外部にある RP での PIM スパースモード



次に、上記のイメージの時系列トラフィックフローを示します。

1. 受信側は VTEP 3 に (*,G) IGMP join を送信します。(*,G) は VTEP 3 で作成されます。
2. VTEP 3 は、オーバーレイネットワークに RP がある VTEP 2 に MVPN ルートタイプ 6 を送信します。このルートは、VTEP 2 によって RP への (*,G) join に変換されます。
3. 送信元デバイスがデータのストリーミングを開始し、(S,G) が VTEP 1 に作成されます。
4. VTEP 1 は RP を使用して送信元登録を実行します。RP からの (S,G) join は、VTEP 2 で (S,G) 状態を作成します。
5. RP には (S,G) の受信側があるため、MVPN ルートタイプ 7 を VTEP 1 に送信し、PIM 登録トラフィックを (*,G) ツリーの受信側に転送します。
6. VTEP 1 は、VTEP 2 から MVPN ルートタイプ 7 を受信してインストールします。レイヤ 3 VNI の SVI を (S,G) の転送インターフェイスとして使用します。

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送信元 VTEP (VTEP 1) は、(S,G) の送信元 A-D ルートを、MVPN アドレスファミリの BGP ピアである他のすべての VTEP にアドバタイズします。

VTEP 2 および VTEP 3 は、(S,G) の送信元 A-D ルートを受信してインストールします。

7. (S,G) は VTEP 3 で作成されます。これで VTEP 3 には (S,G) のオーバーレイルートが備わり、EVPN コントロールプレーンから送信元デバイスへのユニキャストルートも備わります。次に、MVPN ルートタイプ 7 を VTEP 1 に送信し、トラフィックの受け入れを開始します。

VTEP 1 は、VTEP 3 から MVPN ルートタイプ 7 を受信してインストールし、トラフィックの転送を開始します。



- (注) 受信側 VTEP が送信元 VTEP に MVPN ルートタイプ 7 を送信できるようにするために、次の 2 つのトリガーがあります。

- RP から受信側 VTEP に転送される (*,G) パケット。
- 送信元 VTEP から受信した送信元 A-D ルート。

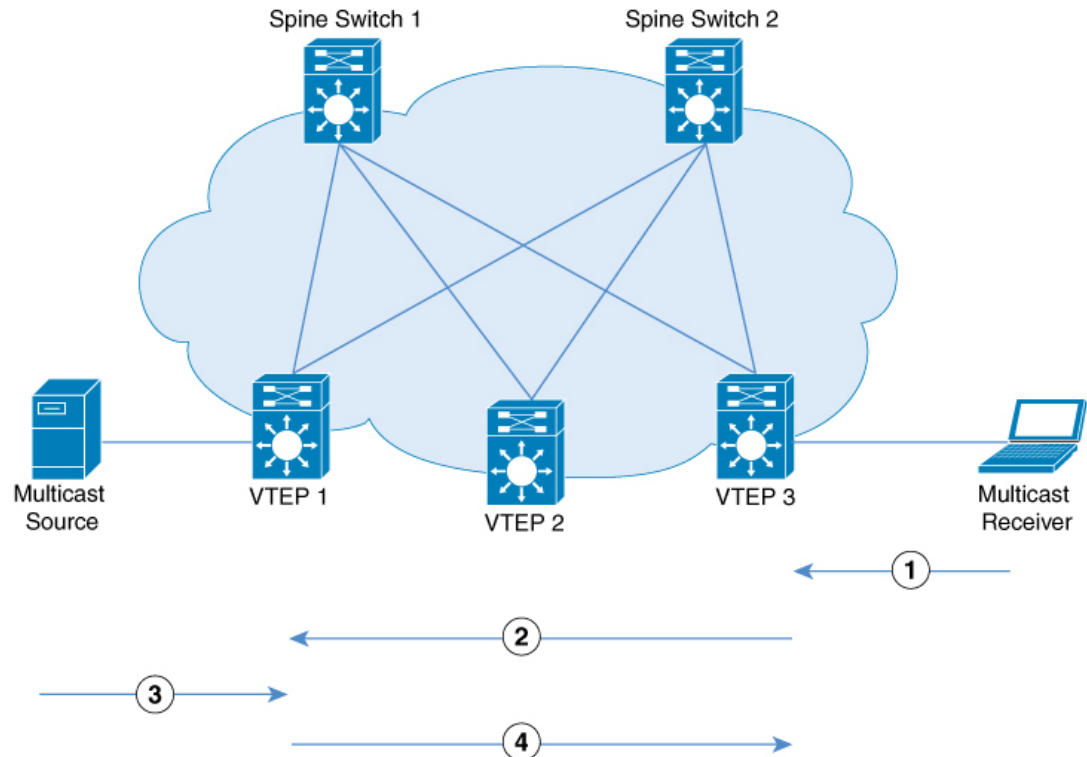
これらのいずれかを受信すると、受信側 VTEP は MVPN ルートタイプ 7 を送信元 VTEP に送信します。

TRM がファブリックの外部にある RP で PIM スパースモードで有効になっている場合に発生するイベントのシーケンスについては、[BGP EVPN VXLAN ファブリック内の RP を使用した PIM スパースモード \(8 ページ\)](#) を参照してください。

PIM ソース固有モードの TRM

PIM 送信元固有モードでは、マルチキャスト コンバージェンスの実現には送信元 A-D ルート (MVPN ルートタイプ 5) は必要ありません。受信側 VTEP は、送信元 A-D ルートを受信して MVPN ルートタイプ 7 を送信するまで待機しません。

図 9: PIM 送信元固有モード



PIM 送信元固有モードでは、次の一連のイベントが発生します。

1. 送信元デバイスがユニキャストパケットを送信すると、VTEP 1 は他のすべての VTEP に EVPN ルートを送信し、パケットが送信元デバイスからのものであることを通知します。
受信側は VTEP 3 に向けて (S,G) IGMP join を送信し、(S,G) エントリが作成されます。
2. VTEP 3 は、送信元デバイスの RPF ルックアップを実行します。レイヤ 3 VNI の SVI が RPF インターフェイスだと判明した場合、VTEP 3 は MVPN ルートタイプ 7 を VTEP 1 に送信します。
3. VTEP 1 は MVPN ルートタイプ 7 を受信してインストールします。VTEP 1 は (S,G) の転送インターフェイスとしてレイヤ 3 VNI の SVI を使用して、(S,G) エントリを作成します。
送信元デバイスは VTEP 1 に (S,G) データを送信します。
4. VTEP 1 が VTEP 3 へのトラフィックの転送を開始します。

Data MDT

データ MDT は、MVPN および EVPN コアで最適化された転送を提供するために設計されたアンダーレイ MDT です。しきい値とアクセス制御の設定を使用して、データ MDT の構築対象となるオーバーレイストリームの特性を制御できます。データ MDT が構築されるしきい値は、VRF 単位でのみ設定できます。マルチキャスト伝送が定義されたしきい値を超えると、送信側

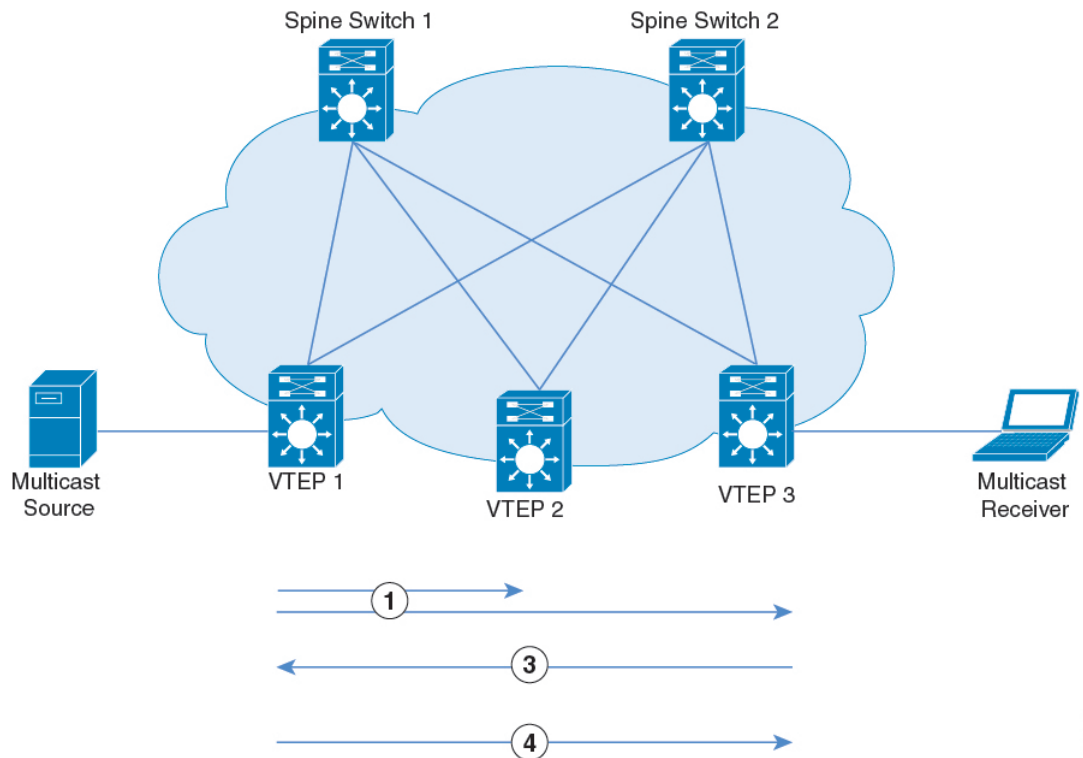
の VTEP デバイスがデータ MDT を作成し、データ MDT に関する情報を含む MVPN ルートタイプ 3 メッセージをデフォルト MDT のすべてのデバイスに送信します。マルチキャストストリームがデータ MDT のしきい値を超えたかどうかを判断する統計情報は、定期的に確認されます。VTEP ルータが MVPN ルートタイプ 3 メッセージを送信した後は、切り替わるまで 3 秒以上かかります。

データ MDT を使用すると、EVPN スパインノードの複製負荷が大幅に削減され、EVPN アンダーレイ全体でのコピー数が少なくなります。データ MDT により、スパインノードと VTEP 間の帯域幅使用率が低下します。特定のオーバーレイストリームを必要としない VTEP でのトラフィック負荷は完全に回避されます。また、データ MDT により、ACL およびしきい値ベースのスイッチオーバーによる導入の柔軟性が得られ、ロードバランシング機能も使用できるようになります。

データ MDT は、VRF マルチキャストルーティングテーブル内で、(S,G) マルチキャストルートエントリ専用で作成されます。個々のソースデータレートの値に関係なく、(*,G) エントリ用には作成されません。しきい値に関係なく、データ MDT への送信が許可されるオーバーレイストリームを制御するように ACL を設定できます。

データ MDT は、すべての TRM モードでサポートされます。サポートされる TRM モードは、エニーキャスト RP を使用した PIM スパースモード、BGP EVPN VXLAN ファブリック内の RP を使用した PIM スパースモード、BGP EVPN VXLAN ファブリックの外部にある RP での PIM スパースモード、および PIM 送信固有マルチキャストモードです。

図 10: データ MDT モード



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BGP EVPN VXLAN ファブリックの外部にある RP での PIM スパースモード、または PIM 送信元固有モードのイベントのシーケンスが完了したら、データ MDT モードの次のイベントシーケンスに進みます。

1. VTEP1 は、他のすべてのノードに MVPN ルートタイプ 3 を送信します。ストリームのしきい値を超過し、MVPN ルートタイプ 3 が送信され、ストリームのデータ MDT がアドバタイズされます。3 秒後、VTEP1 は MVPN ルートタイプ 3 を使用して、ストリームをデフォルト MDT からデータ MDT に切り替えます。VTEP3 のみがストリームデータを受信します。
2. VTEP2 にはレシーバがないため、アドバタイズされたデータ MDT アンダーレイには参加しません。
3. VTEP3 にはレシーバがあり、アドバタイズされたデータ MDT アンダーレイに参加します。

テナントルーテッドマルチキャストの設定方法

TRM 設定の前提条件

TRM を設定する前に、EVPN VXLAN レイヤ 2 およびレイヤ 3 のオーバーレイネットワークが設定されていることを確認します。レイヤ 2 およびレイヤ 3 のオーバーレイネットワークを設定する詳細な手順については、[EVPN VXLAN Integrated Routing and Bridging の設定方法](#)を参照してください。

EVPN VXLAN ネットワークで TRM を設定するには、次の一連の手順を実行します。

PIM スパースモードでの TRM 設定

PIM スパースモードで TRM を設定するには、次のタスクを実行します。

- [VRF での TRM マルチキャスト配布ツリーの設定 \(14 ページ\)](#)
- [オーバーレイ VRF でのマルチキャストルーティングの設定 \(16 ページ\)](#)
- [コア側 VLAN とアクセス側 VLAN に対するスイッチ仮想インターフェイスでのマルチキャストの設定 \(17 ページ\)](#)
- [VTEP での MVPN アドレスファミリーを使用した BGP の設定 \(18 ページ\)](#)
- [アンダーレイネットワークに対する RP の設定 \(19 ページ\)](#)
- [オーバーレイネットワークに対する RP の設定 \(20 ページ\)](#)

VRF での TRM マルチキャスト配布ツリーの設定

TRM MDT を設定するには、次の手順を実行します。

手順

	コマンドまたはアクション	目的
ステップ 1	enable 例： Device> enable	特権 EXEC モードを有効にします。 プロンプトが表示されたらパスワードを入力します。
ステップ 2	configure terminal 例： Device# configure terminal	グローバル コンフィギュレーションモードを開始します。
ステップ 3	vrf definition vrf-name 例： Device (config)# vrf definition green	VRF 名を指定し、VRF コンフィギュレーションモードを開始します。
ステップ 4	address-family { ipv4 ipv6 } 例： Device (config-vrf)# address-family ipv4	VRF を指定し、VRF アドレスファミリー設定モードを開始します。 <ul style="list-style-type: none"> • ipv4 キーワードを使用して IPv4 アドレスファミリーを設定します。 • ipv6 キーワードを使用して IPv6 アドレスファミリーを設定します。
ステップ 5	mdt default vxlan group-address 例： Device (config-vrf-af)# mdt default vxlan 225.2.2.2	VXLAN の VRF のデフォルト MDT グループにマルチキャストグループアドレス範囲を設定します。
ステップ 6	mdt auto-discovery vxlan [inter-as] 例： Device (config-vrf-af)# mdt auto-discovery vxlan	BGP 自動検出を使用して VXLAN を有効にします。 BGP 自律システム (AS) 境界を通過するには、MVPN アドレスファミリールートに inter-as キーワードを使用します。
ステップ 7	mdt overlay use-bgp [spt-only] 例： Device (config-vrf-af)# mdt overlay use-bgp spt-only	BGP EVPN VXLAN ファブリック内で動作するように、PIM スパースモードで TRM によって使用されるメカニズムを設定します。 オーバーレイプロトコルとして BGP を指定します。 <ul style="list-style-type: none"> • エニーキャスト RP で PIM スパースモードを設定するには、mdt

	コマンドまたはアクション	目的
		<p>overlay use-bgp spt-only コマンドを使用します。</p> <ul style="list-style-type: none"> • mdt overlay use-bgp コマンドを使用して、BGP EVPN VXLAN ファブリックの内部または外部で単一の RP を使用する PIM スパースモードを設定します。
ステップ 8	<p>mdt data vxlan data-mdt-subnet data-mdt-mask [list access-list-number]</p> <p>例 :</p> <pre>Device(config-vrf-af) # mdt data vxlan 225.2.2.0 0.0.0.255 list 101</pre>	(任意) VXLAN の VRF のデータ MDT グループにマルチキャストグループアドレス範囲を設定します。
ステップ 9	<p>mdt data threshold kb/s</p> <p>例 :</p> <pre>Device(config-vrf-af) # mdt data threshold 111</pre>	(任意) 帯域幅しきい値をキロビット/秒 (kb/s) 単位で定義します。範囲は 1 ~ 4294967 で、デフォルトの値は 0 です。
ステップ 10	<p>exit-address-family</p> <p>例 :</p> <pre>Device(config-vrf-af) # exit-address-family</pre>	VRF アドレスファミリー コンフィギュレーションモードを終了し、VRF コンフィギュレーションモードに戻ります。
ステップ 11	<p>end</p> <p>例 :</p> <pre>Device(config-vrf) # end</pre>	特権 EXEC モードに戻ります。

オーバーレイ VRF でのマルチキャストルーティングの設定

オーバーレイ VRF でマルチキャストルーティングを有効にするには、次の手順を実行します。

手順

	コマンドまたはアクション	目的
ステップ 1	<p>enable</p> <p>例 :</p> <pre>Device> enable</pre>	特権 EXEC モードを有効にします。 プロンプトが表示されたらパスワードを入力します。
ステップ 2	<p>configure terminal</p> <p>例 :</p> <pre>Device# configure terminal</pre>	グローバル コンフィギュレーションモードを開始します。

	コマンドまたはアクション	目的
ステップ 3	ip multicast-routing vrf vrf-name 例： Device(config)# ip multicast-routing vrf green	オーバーレイ VRF で IP マルチキャスト転送を有効にします。
ステップ 4	ipv6 unicast-routing 例： Device(config)# ipv6 unicast-routing	IPv6 ユニキャスト転送を有効にします。
ステップ 5	ipv6 multicast-routing vrf vrf-name 例： Device(config)# ipv6 multicast-routing vrf green	オーバーレイ VRF で IPv6 マルチキャスト転送を有効にします。
ステップ 6	end 例： Device(config)# end	特権 EXEC モードに戻ります。

コア側 VLAN とアクセス側 VLAN に対するスイッチ仮想インターフェイスでのマルチキャストの設定

VTEP のコア側 VLAN とアクセス側 VLAN の SVI でマルチキャストを設定するには次の手順を実行します。

手順

	コマンドまたはアクション	目的
ステップ 1	enable 例： Device> enable	特権 EXEC モードを有効にします。 プロンプトが表示されたらパスワードを入力します。
ステップ 2	configure terminal 例： Device# configure terminal	グローバル コンフィギュレーションモードを開始します。
ステップ 3	interface vlan core-facing-vlan-id 例： Device(config)# interface vlan 200	指定した VLAN のインターフェイス コンフィギュレーションモードを開始します。
ステップ 4	ip pim sparse-mode 例： Device(config-if) # ip pim sparse-mode	コア側 SVI で IPv4 マルチキャストを有効にします。

VTEPでのMVPNアドレスファミリーを使用したBGPの設定

	コマンドまたはアクション	目的
ステップ 5	exit 例： Device(config-if) # end	特権 EXEC モードに戻ります。
ステップ 6	interface vlan <i>access-facing-vlan-id</i> 例： Device(config) # interface vlan 202	指定した VLAN のインターフェイス コンフィギュレーションモードを開始します。
ステップ 7	ip pim sparse-mode 例： Device(config-if) # ip pim sparse-mode	送信元または受信側が接続されているアクセス側の SVI で IPv4 マルチキャストを有効にします。 送信元と受信側が接続されているレイヤ 2 VNI の一部であるすべてのアクセス側 SVI に対して、この手順を繰り返します。
ステップ 8	end 例： Device(config-if) # end	特権 EXEC モードに戻ります。

VTEPでのMVPNアドレスファミリーを使用したBGPの設定

MVPN アドレスファミリーを使用して VTEP で BGP を設定するには、次の手順を実行します。

手順

	コマンドまたはアクション	目的
ステップ 1	enable 例： Device> enable	特権 EXEC モードを有効にします。 プロンプトが表示されたらパスワードを入力します。
ステップ 2	configure terminal 例： Device# configure terminal	グローバル コンフィギュレーションモードを開始します。
ステップ 3	router bgp <i>autonomous-system-number</i> 例： Device(config) # router bgp 1	BGP ルーティングプロセスを有効にし、自律システム番号を割り当て、ルータ コンフィギュレーションモードを開始します。

	コマンドまたはアクション	目的
ステップ 4	address-family { ipv4 ipv6 } mvpn 例 : Device(config-router)# address-family ipv4 mvpn	MVPN アドレス ファミリを指定し、アドレス ファミリ コンフィギュレーション モードを開始します。 <ul style="list-style-type: none"> • ipv4 キーワードを使用して IPv4 MVPN アドレスファミリを設定します。 • ipv6 キーワードを使用して IPv6 MVPN アドレスファミリを設定します。
ステップ 5	neighbor ip-address activate 例 : Device(config-router-af)# neighbor 10.2.2.20 activate	BGP ネイバーとの情報交換を有効にします。 スパインスイッチの IP アドレスをネイバー IP アドレスとして使用します。
ステップ 6	neighbor ip-address send-community extended 例 : Device(config-router-af)# neighbor 10.2.2.20 send-community both	BGP ネイバーに送信したコミュニティ属性を指定します。 スパインスイッチの IP アドレスをネイバー IP アドレスとして使用します。
ステップ 7	neighbor ip-address advertisement-interval seconds 例 : Device(config-router-af)# neighbor 10.2.2.20 advertisement-interval 10	(任意) BGP ルーティングの更新間の最小ルート アドバタイズメント インターバル (MRAI) を設定します。
ステップ 8	exit-address-family 例 : Device(config-router-af)# exit-address-family	アドレス ファミリ コンフィギュレーション モードを終了し、ルータ コンフィギュレーションモードに戻ります。
ステップ 9	end 例 : Device(config-router)# end	特権 EXEC モードに戻ります。

アンダーレイネットワークに対する RP の設定

アンダーレイネットワークに RP を設定するには、次の手順を実行します。



(注) スパインスイッチをアンダーレイネットワークの RP として設定することを推奨します。

手順

	コマンドまたはアクション	目的
ステップ 1	enable 例： Device> enable	特権 EXEC モードを有効にします。 プロンプトが表示されたらパスワードを入力します。
ステップ 2	configure terminal 例： Device# configure terminal	グローバル コンフィギュレーションモードを開始します。
ステップ 3	ip pim rp-address ip-address-of-rp 例： Device(config)# ip pim rp-address <rp-ip-address>	アンダーレイネットワークに RP を設定します。 RP の冗長性については、『 <i>IP Multicast Routing Configuration Guide</i> 』を参照してください。
ステップ 4	end 例： Device(config)# end	特権 EXEC モードに戻ります。

オーバーレイネットワークに対する RP の設定

オーバーレイネットワークに RP を設定するには、次の手順を実行します。

手順

	コマンドまたはアクション	目的
ステップ 1	enable 例： Device> enable	特権 EXEC モードを有効にします。 プロンプトが表示されたらパスワードを入力します。
ステップ 2	configure terminal 例： Device# configure terminal	グローバル コンフィギュレーションモードを開始します。
ステップ 3	interface loopback-interface 例： Device(config)# interface Loopback 13	指定したループバックインターフェイスのインターフェイス コンフィギュレーションモードを開始します。
ステップ 4	vrf forwarding vrf-name 例：	ループバックインターフェイスの転送テーブルを設定します。

	コマンドまたはアクション	目的
	Device (config-if) # vrf forwarding green	
ステップ 5	ip-address ip-address subnet-mask 例 : Device (config-if) # ip address 10.1.13.13 255.255.255.255	ループバック インターフェイスの IP アドレスを設定します。
ステップ 6	ip pim sparse-mode 例 : Device (config-if) # ip pim sparse-mode	ループバック インターフェイスでの IPv4 マルチキャストを有効にします。 (注) EVPN VXLAN レイヤ 2 オーバーレイネットワークが、BUM トラフィックを転送するためのメカニズムとしてアンダーレイマルチキャストを使用して VTEP でも設定されている場合にのみ、PIM スパースモードを有効にします。
ステップ 7	exit 例 : Device (config-if) # exit	グローバル コンフィギュレーション モードに戻ります。
ステップ 8	{ip ipv6 } pim vrf vrf-name rp-address rp-address 例 : Device (config) # ip pim vrf green rp-address 10.1.13.13	ローカル VTEP のアドレスをマルチキャストグループの PIM RP として設定します。 <ul style="list-style-type: none"> • エニーキャスト RP を使用した PIM-SM モードでは、ローカル VTEP のループバック インターフェイスのアドレスを使用します。 • BGP EVPN VXLAN ファブリックの内部または外部の RP を使用する PIM-SM では、RP の IP アドレスを使用します。 (注) 指定したループバック インターフェイスは、同じ VRF の一部である必要があります。

	コマンドまたはアクション	目的
ステップ 9	<pre>{ip ipv6 } pim vrf vrf-name register-source loopback-address-of-vtep</pre> <p>例 :</p> <pre>Device(config)# ip pim vrf green register-source loopback901</pre>	マルチキャストトラフィックへのファーストホップルータとして機能する VTEP のループバックインターフェイスの、一意の IP アドレスを設定します。
ステップ 10	<pre>end</pre> <p>例 :</p> <pre>Device(config)# end</pre>	特権 EXEC モードに戻ります。

PIM 固有モードでの TRM の設定

PIM 送信元固有モードで TRM を設定するには、次のタスクを実行します。

- [VRF での TRM マルチキャスト配布ツリーの設定 \(14 ページ\)](#)
- [オーバーレイ VRF でのマルチキャストルーティングの設定 \(16 ページ\)](#)
- [コア側 VLAN とアクセス側 VLAN に対するスイッチ仮想インターフェイスでのマルチキャストの設定 \(17 ページ\)](#)
- [VTEP での MVPN アドレスファミリーを使用した BGP の設定 \(18 ページ\)](#)
- [アンダーレイネットワークに対する RP の設定 \(19 ページ\)](#)
- [オーバーレイネットワークに対する SSM の設定 \(22 ページ\)](#)

オーバーレイネットワークに対する SSM の設定

オーバーレイネットワークに SSM を設定するには、次の手順を実行します。

手順

	コマンドまたはアクション	目的
ステップ 1	<pre>enable</pre> <p>例 :</p> <pre>Device> enable</pre>	特権 EXEC モードを有効にします。 プロンプトが表示されたらパスワードを入力します。
ステップ 2	<pre>configure terminal</pre> <p>例 :</p> <pre>Device# configure terminal</pre>	グローバル コンフィギュレーションモードを開始します。
ステップ 3	<pre>ip pim [vrf vrf-name] ssm {default range access-list }</pre>	TRM の SSM の範囲を設定します。

	コマンドまたはアクション	目的
	例 : Device(config)# ip pim vrf green ssm default	default キーワードは SSM 範囲のアクセスリストを 232/8 と定義します。 range キーワードは標準の IP アクセスリスト番号または SSM 範囲を定義する名前を指定します。
ステップ 4	end 例 : Device(config)# end	特権 EXEC モードに戻ります。

テナントルーテッドマルチキャストの確認

次の表に、TRM の確認に使用する **show** コマンドを示します。

コマンド	目的
show nve peers	ピアリーフスイッチの NVE インターフェイスの状態の情報を表示します。
show l2vpn evpn peers vxlan	VXLAN のレイヤ 2 EVPN ピアルートカウントと稼働時間を表示します。
show ip igmp vrf green groups	マルチキャスト仮想ルーティングおよび転送 (MVRF) インスタンスに関連するルータに直接接続され、IGMP を通じて学習された受信側を含むマルチキャストグループを表示します。
show bgp ipv4 mvpn all	BGP MVPN C ルートシグナリングの MVPN オプションを表示します。
show ip mroute vrf green	特定の MVRF インスタンスに関連する mroute テーブルの内容を表示します。
show ip mfib vrf green	MVRF インスタンスに関連付けられた IPv4 マルチキャスト転送情報ベース (MFIB) の転送エントリとインターフェイスを表示します。
show ip mroute	マルチキャストルーティングテーブル情報を表示します。
show ip mfib	IPv4 MFIB での転送エントリおよびインターフェイスを表示します。

テナントルーテッドマルチキャストのトラブルシューティング

BGP EVPN VXLAN ファブリックの TRM の問題をトラブルシューティングする方法については、『[Troubleshoot EVPN VxLAN TRM on Catalyst 9000 Switches](#)』ドキュメントを参照してください。

テナントルーテッドマルチキャストの設定例

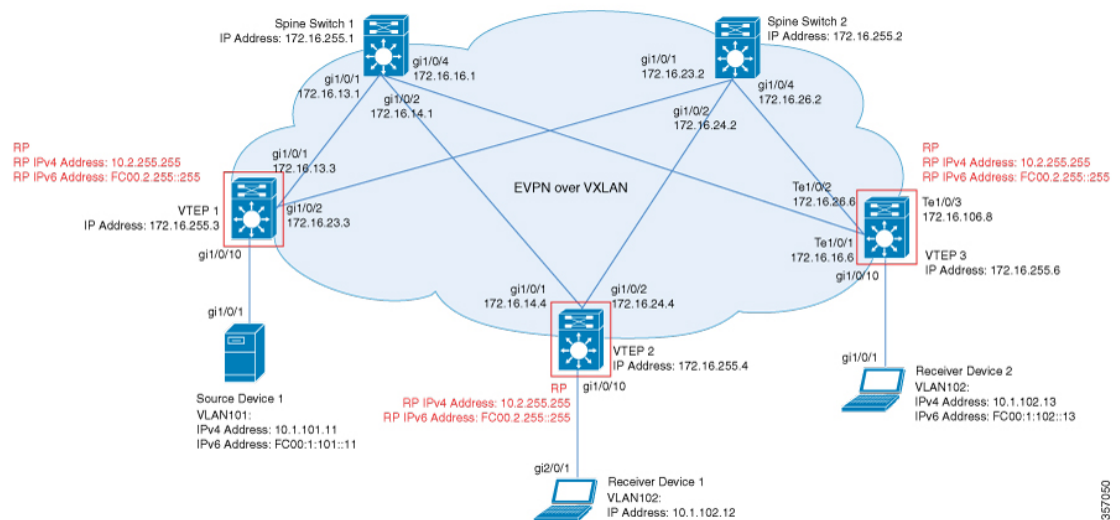
次の項では、さまざまなシナリオでの TRM の設定例を示します。



(注) これらの設定例では、データ MDT 機能は有効になっていません。

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

この例では、すべての VTEP が RP で、BGP EVPN VXLAN ファブリックの内部にある場合に IPv4 および IPv6 マルチトラフィックに PIM-SM を使用してレイヤ 3 TRM を設定し、確認する方法を示します。



次のトポロジは、受信側デバイスと送信元デバイスが VTEP 1 と VTEP 2 にそれぞれ接続された EVPN VXLAN ネットワークを示しています。このトポロジでは、IPv4 マルチキャストグ

ループは 226.1.1.1、IPv6 マルチキャストグループは FF06:1::1 です。次の表に、このトポロジのデバイスの設定例を示します。

表 1: IPv4 および IPv6 マルチキャストトラフィック用のエニーキャスト RP を使用して PIM-SM で TRM を設定するための VTEP1、VTEP2、および VTEP3 の設定

VTEP 1	VTEP 2	VTEP 3
<pre>Leaf-01# show running-config hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>	<pre>Leaf-02# show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>	<pre>Leaf-03# show running-config hostname Leaf-03 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp spt-only route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>

例：エニーキャストRPを使用したPIMスパースモードでのTRMの設定

VTEP 1	VTEP 2	VTEP 3
<pre>interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ipv6 address FC00:2:255::255/128 ipv6 enable ! interface Loopback901 vrf forwarding green ip address 10.1.255.1 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::1/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access !</pre>	<pre>interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ipv6 address FC00:2:255::2/128 ipv6 enable ! interface Loopback901 vrf forwarding green ip address 10.1.255.2 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::2/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 102 switchport mode access !</pre>	<pre>interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ipv6 address FC00:2:255::255/128 ipv6 enable ! interface Loopback901 vrf forwarding green ip address 10.1.255.3 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::3/128 ipv6 enable ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/2 no switchport ip address 172.16.26.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/10 switchport access vlan 102 switchport mode access !</pre>

VTEP 1	VTEP 2	VTEP 3
<pre> interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! </pre>	<pre> interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! </pre>	<pre> interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! </pre>

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

VTEP 1	VTEP 2	VTEP 3
<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end Leaf-01# </pre>	<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end Leaf-02# </pre>	<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end Leaf-03# </pre>

表 2: IPv4 および IPv6 のマルチキャストトラフィック用のエニーキャスト RP を使用して PIM-SM で TRM を設定するためのスパインスイッチ 1 およびスパインスイッチ 2 の設定

スパインスイッチ 1	スパインスイッチ 2
------------	------------

例：エニーキャストRPを使用したPIMスパースモードでのTRMの設定

スパインスイッチ1	スパインスイッチ2
<pre> Spine-01# show running-config hostname Spine-01 ! ip routing ! ip multicast-routing ! ipv6 unicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.14.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.16.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.1 ! router bgp 65001 bgp router-id 172.16.255.1 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! </pre>	<pre> Spine-02# show running-config hostname Spine-02 ! ip routing ! ip multicast-routing ! ipv6 unicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.26.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.2 ! router bgp 65001 bgp router-id 172.16.255.2 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! </pre>

スパインスイッチ 1	スパインスイッチ 2
<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end Spine-01# </pre>	<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end Spine-02# </pre>

IPv4 および IPv6 マルチキャストトラフィック用のエニーキャスト RP を使用した PIM-SM での TRM の確認

次の項では、上記で設定したトポロジのデバイスで PIM-SM を使用して TRM を確認する **show** コマンドの出力例を示します。

- [VTEP 1 の設定を確認する出力 \(32 ページ\)](#)
- [VTEP 2 の設定を確認する出力 \(39 ページ\)](#)
- [VTEP 3 の設定を確認する出力 \(46 ページ\)](#)
- [スパインスイッチ 1 の設定を確認するための出力 \(54 ページ\)](#)
- [スパインスイッチ 2 の設定を確認するための出力 \(59 ページ\)](#)

VTEP 1 の設定を確認する出力

次に、VTEP 1 での **show nve peers** コマンドの出力例を示します。

```
Leaf-01# show nve peers
Interface VNI      Type Peer-IP           RMAC/Num_RTs  eVNI      state flags UP time
nve1      50901   L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/-/4 01:47:43
nve1      50901   L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/-/4 01:47:43
nve1      50901   L3CP 172.16.254.6     0c75.bd67.ef48 50901      UP  A/M/6 01:47:43
nve1      50901   L3CP 172.16.254.4     7c21.0dbd.9548 50901      UP  A/M/6 01:47:43
nve1      10102   L2CP 172.16.254.4     7              10102      UP  N/A   01:47:43
nve1      10102   L2CP 172.16.254.6     7              10102      UP  N/A   01:47:43
Leaf-01#
```

次に、VTEP 1 での **show l2vpn evpn peers vxlan** コマンドの出力例を示します。

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP           Num routes eVNI      UP time
-----
nve1      10102   172.16.254.4     7          10102    01:47:43
nve1      10102   172.16.254.6     7          10102    01:47:43
```

```
Leaf-01#show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 8, main routing table version 8
3 network entries using 1176 bytes of memory
4 path entries using 640 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4456 total bytes of memory
BGP activity 69/0 prefixes, 92/2 paths, scan interval 60 secs
3 networks peaked at 11:32:31 Sep 16 2020 UTC (01:42:43.716 ago)

Neighbor      V          AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4          65001   140    127     8     0    0 01:48:48      1
172.16.255.2  4          65001   146    128     8     0    0 01:48:40      1
Leaf-01#
```


次に、VTEP 1 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```
Leaf-01# show bgp ipv6 mvpn all
BGP table version is 8, local router ID is 172.16.255.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
*> [5][1:1][FC00:1:101::11][FF06:1::1]/42
      ::                                32768 ?
*>i [7][1:1][65001][FC00:1:101::11][FF06:1::1]/46
      172.16.255.4                0    100    0 ?
Route Distinguisher: 172.16.254.3:101
* i [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
      172.16.255.4                0    100    0 ?
*>i [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
      172.16.255.4                0    100    0 ?
Leaf-01#
```

次に、VTEP 1 での **show bgp l2vpn evpn summary** コマンドの出力例を示します。

```
Leaf-01# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 65, main routing table version 65
42 network entries using 16128 bytes of memory
60 path entries using 12720 bytes of memory
11/11 BGP path/bestpath attribute entries using 3168 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 34048 total bytes of memory
BGP activity 69/0 prefixes, 92/2 paths, scan interval 60 secs
42 networks peaked at 11:27:30 Sep 16 2020 UTC (01:47:45.010 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1  4      65001   140    127     65    0   0 01:48:48    18
172.16.255.2  4      65001   146    128     65    0   0 01:48:40    18
Leaf-01#
```

次に、VTEP 1 での **show bgp l2vpn evpn** コマンドの出力例を示します。

```
Leaf-01# show bgp l2vpn evpn summary
BGP table version is 65, local router ID is 172.16.255.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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: 172.16.254.3:101
*> [2][172.16.254.3:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
```

例：エニーキャストRPを使用したPIMスパースモードでのTRMの設定

```

::
32768 ?
*> [2] [172.16.254.3:101] [0] [48] [10B3D56A8FC1] [128] [FC00:1:101::1]/36
::
32768 ?
*> [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [0] [*]/20
::
32768 ?
*> [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [32] [10.1.101.11]/24
::
32768 ?
*> [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [128] [FC00:1:101::11]/36
::
32768 ?
*> [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [128] [FE80::F6CF:E2FF:FE43:34C1]/36
::
32768 ?
Route Distinguisher: 172.16.254.3:102
*>i [2] [172.16.254.3:102] [0] [48] [0C75BD67EF4D] [32] [10.1.102.1]/24
172.16.254.6 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [0C75BD67EF4D] [128] [FC00:1:102::1]/36
172.16.254.6 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [44D3CA286CC5] [0] [*]/20
172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [44D3CA286CC5] [32] [10.1.102.12]/24
172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [44D3CA286CC5] [128] [FC00:1:102::12]/36
172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [44D3CA286CC5] [128] [FE80::46D3:CAFF:FE28:6CC5]/36
172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [7C210DBD954D] [32] [10.1.102.1]/24
172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [7C210DBD954D] [128] [FC00:1:102::1]/36
172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [ECE1A93792C5] [0] [*]/20
172.16.254.6 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [ECE1A93792C5] [32] [10.1.102.13]/24
172.16.254.6 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [ECE1A93792C5] [128] [FC00:1:102::13]/36
172.16.254.6 0 100 0 ?
*>i [2] [172.16.254.3:102] [0] [48] [ECE1A93792C5] [128] [FE80::EEE1:A9FF:FE37:92C5]/36
172.16.254.6 0 100 0 ?
Route Distinguisher: 172.16.254.4:102
*>i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [0] [*]/20
172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [32] [10.1.102.12]/24
172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [128] [FC00:1:102::12]/36
172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [128] [FE80::46D3:CAFF:FE28:6CC5]/36
172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [32] [10.1.102.1]/24
172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
*>i [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [128] [FC00:1:102::1]/36
172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
Route Distinguisher: 172.16.254.6:102
*>i [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [32] [10.1.102.1]/24
172.16.254.6 0 100 0 ?
* i 172.16.254.6 0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [128] [FC00:1:102::1]/36
172.16.254.6 0 100 0 ?
* i 172.16.254.6 0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [0] [*]/20
172.16.254.6 0 100 0 ?

```

```

* i          172.16.254.6          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [32] [10.1.102.13]/24
          172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FC00:1:102::13]/36
          172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FE80::EEE1:A9FF:FE37:92C5]/36
          172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
Route Distinguisher: 1:1 (default for vrf green)
*> [5] [1:1] [0] [24] [10.1.101.0]/17
          0.0.0.0          0          32768 ?
*>i [5] [1:1] [0] [24] [10.1.102.0]/17
          172.16.254.4          0 100 0 ?
* i          172.16.254.4          0 100 0 ?
*> [5] [1:1] [0] [32] [10.1.255.1]/17
          0.0.0.0          0          32768 ?
*>i [5] [1:1] [0] [32] [10.1.255.2]/17
          172.16.254.4          0 100 0 ?
* i          172.16.254.4          0 100 0 ?
*>i [5] [1:1] [0] [32] [10.1.255.3]/17
          172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
*> [5] [1:1] [0] [32] [10.2.255.255]/17
          0.0.0.0          0          32768 ?
*> [5] [1:1] [0] [64] [FC00:1:101::]/29
          ::          0          32768 ?
*>i [5] [1:1] [0] [64] [FC00:1:102::]/29
          172.16.254.4          0 100 0 ?
* i          172.16.254.4          0 100 0 ?
*> [5] [1:1] [0] [128] [FC00:1:255::1]/29
          ::          0          32768 ?
*>i [5] [1:1] [0] [128] [FC00:1:255::2]/29
          172.16.254.4          0 100 0 ?
* i          172.16.254.4          0 100 0 ?
*>i [5] [1:1] [0] [128] [FC00:1:255::3]/29
          172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
*> [5] [1:1] [0] [128] [FC00:2:255::255]/29
          ::          0          32768 ?
Leaf-01#

```

次に、VTEP 1 での **show ipv6 pim vrfvrf-name group-map** コマンドの出力例を示します。

```

Leaf-01# show ipv6 pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
  SM, RP: FC00:2:255::255
  RPF: Tu2,FC00:2:255::255 (us)
  Info source: Static
  Uptime: 01:49:05, Groups: 1
Leaf-01#

```

次に、VTEP 1 での **show ipv6 route vrf** コマンドの出力例を示します。

```

Leaf-01# show ipv6 route vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128

```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```

Known via "connected", distance 0, metric 0, type receive, connected
Redistributing via bgp 65001
Route count is 1/1, share count 0
Routing paths:
  receive via Loopback255
    Last updated 01:49:06 ago
Leaf-01#

```

次に、VTEP 1 での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

```

Leaf-01# show ipv6 mld vrf green groups
No groups found.
Leaf-01#

```

次に、VTEP 1 での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```

Leaf-01# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(FC00:1:101::11, FF06:1::1), 01:42:44/00:03:19, flags: SFTGq
  Incoming interface: Vlan101
  RPF nbr: FE80::F6CF:E2FF:FE43:34C1
  Immediate Outgoing interface list:
    Vlan901, Forward, 01:42:44/never
Leaf-01#

```

次に、VTEP 1 での **show ipv6 mfib vrf vrf-name** コマンドの出力例を示します。

```

Leaf-01# show ipv6 mfib vrf green
Entry Flags:   C - Directly Connected, S - Signal, IA - Inherit A flag,
              ET - Data Rate Exceeds Threshold, K - Keepalive
              DDE - Data Driven Event, HW - Hardware Installed
              ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
              MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
              MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
              e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(FC00:1:101::11,FF06:1::1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 1/0/1
  HW Forwarding:  3161/0/118/0, Other: 0/0/0
  Vlan101 Flags: A

```

```
Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
Pkts: 0/0/0 Rate: 0 pps
Leaf-01#
```

次に、VTEP 1 での **show ip mroute** コマンドの出力例を示します。

```
Leaf-01# show 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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 01:48:56/stopped, RP 172.16.255.255, flags: SJCFx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
Tunnel0, Forward/Sparse, 01:48:56/00:02:56

(172.16.254.3, 239.1.1.1), 01:42:42/00:03:20, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0
Outgoing interface list:
GigabitEthernet1/0/2, Forward/Sparse, 01:42:42/00:03:03

(*, 224.0.1.40), 01:49:06/00:02:55, RP 172.16.255.255, flags: SJCL
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
Loopback0, Forward/Sparse, 01:49:05/00:02:55

(*, 225.0.0.102), 01:48:56/stopped, RP 172.16.255.255, flags: SJCx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
Tunnel0, Forward/Sparse, 01:48:56/00:02:56

(172.16.254.4, 225.0.0.102), 01:48:17/00:01:19, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
Tunnel0, Forward/Sparse, 01:48:17/00:02:56

(172.16.254.6, 225.0.0.102), 01:48:23/00:01:18, flags: Tx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
Tunnel0, Forward/Sparse, 01:48:23/00:02:56

(*, 225.0.0.101), 01:49:01/stopped, RP 172.16.255.255, flags: SJCFx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
Tunnel0, Forward/Sparse, 01:48:56/00:02:56

(172.16.254.3, 225.0.0.101), 01:49:01/00:02:45, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0
```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 01:48:25/00:03:12
Leaf-01#
```

次に、VTEP 1 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-01# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
                  e  - Encap helper tunnel flag.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Loopback0 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 2/0/125/0, Other: 1/0/1
  HW Forwarding: 554/0/163/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1/0/172/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding: 561/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 1/1/0
  HW Forwarding: 504/0/205/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
```

```
(* ,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,239.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0 Rate: 0 pps
(172.16.254.3,239.1.1.1) Flags: HW
  SW Forwarding: 1/0/150/0, Other: 1/1/0
  HW Forwarding: 3071/0/156/0, Other: 0/0/0
  Null0 Flags: A
  GigabitEthernet1/0/2 Flags: F NS
    Pkts: 0/0/0 Rate: 0 pps
Leaf-01#
```

[IPv4 および IPv6 マルチキャストトラフィック用のエニーキャスト RP を使用した PIM-SM での TRM の確認 \(32 ページ\)](#) に戻ります。

VTEP 2 の設定を確認する出力

次に、VTEP 2 での **show nve peers** コマンドの出力例を示します。

```
Leaf-02# show nve peers
Interface VNI      Type Peer-IP          RMAC/Num_RTs  eVNI      state flags UP time
nve1      50901    L3CP 172.16.254.6    0c75.bd67.ef48 50901     UP  A/-/4 01:52:57
nve1      50901    L3CP 172.16.254.3    10b3.d56a.8fc8 50901     UP  A/-/4 01:52:57
nve1      50901    L3CP 172.16.254.6    0c75.bd67.ef48 50901     UP  A/M/6 01:52:57
nve1      50901    L3CP 172.16.254.3    10b3.d56a.8fc8 50901     UP  A/M/6 01:52:57
nve1      10101    L2CP 172.16.254.3      7             10101     UP  N/A   01:52:57
nve1      10102    L2CP 172.16.254.6      7             10102     UP  N/A   01:52:57
Leaf-02#
```

次に、VTEP 2 での **show l2vpn evpn peers vxlan** コマンドの出力例を示します。

```
Leaf-02# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP          Num routes eVNI      UP time
-----
nve1      10101    172.16.254.3    7          10101     01:52:57
nve1      10102    172.16.254.6    7          10102     01:52:57
Leaf-02#
```

次に、VTEP 2 での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Leaf-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 5, main routing table version 5
2 network entries using 784 bytes of memory
3 path entries using 480 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3904 total bytes of memory
BGP activity 70/0 prefixes, 101/6 paths, scan interval 60 secs
```

例：エニーキャスト RP を使用した PIM スペースモードでの TRM の設定

```
2 networks peaked at 11:37:07 Sep 16 2020 UTC (01:47:58.150 ago)

Neighbor      V          AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4          65001   150    133      5     0     0 01:53:34      1
172.16.255.2  4          65001   151    134      5     0     0 01:53:30      1
Leaf-02#
```

次に、VTEP 2 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```
Leaf-02# show bgp ipv6 mvpn all
BGP table version is 5, local router ID is 172.16.255.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
 * i  [5][1:1][FC00:1:101::11][FF06:1::1]/42
      172.16.255.3          0    100    0 ?
 *>i  172.16.255.3          0    100    0 ?
Route Distinguisher: 172.16.254.3:101
 *>  [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
      ::                      32768 ?
Leaf-02#
```

次に、VTEP 2 での **show bgp l2vpn evpn summary** コマンドの出力例を示します。

```
Leaf-02# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 43, main routing table version 43
42 network entries using 16128 bytes of memory
64 path entries using 13568 bytes of memory
12/12 BGP path/bestpath attribute entries using 3456 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 35184 total bytes of memory
BGP activity 70/0 prefixes, 101/6 paths, scan interval 60 secs
42 networks peaked at 11:32:07 Sep 16 2020 UTC (01:52:58.436 ago)

Neighbor      V          AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4          65001   150    133      43     0     0 01:53:35      20
172.16.255.2  4          65001   151    134      43     0     0 01:53:31      20
Leaf-02#
```

次に、VTEP 2 での **show bgp l2vpn evpn** コマンドの出力例を示します。

```
Leaf-02# show bgp l2vpn evpn
BGP table version is 43, local router ID is 172.16.255.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
```



```

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: 172.16.254.3:101
*>i [2] [172.16.254.3:101] [0] [48] [10B3D56A8FC1] [32] [10.1.101.1]/24
      172.16.254.3          0          100          0 ?
* i          172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.3:101] [0] [48] [10B3D56A8FC1] [128] [FC00:1:101::1]/36
      172.16.254.3          0          100          0 ?
* i          172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [0] [*]/20
      172.16.254.3          0          100          0 ?
* i          172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [32] [10.1.101.11]/24
      172.16.254.3          0          100          0 ?
* i          172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [128] [FC00:1:101::11]/36
      172.16.254.3          0          100          0 ?
* i          172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [128] [FE80::F6CF:E2FF:FE43:34C1]/36
      172.16.254.3          0          100          0 ?
* i          172.16.254.3          0          100          0 ?
Route Distinguisher: 172.16.254.4:101
*>i [2] [172.16.254.4:101] [0] [48] [10B3D56A8FC1] [32] [10.1.101.1]/24
      172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.4:101] [0] [48] [10B3D56A8FC1] [128] [FC00:1:101::1]/36
      172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.4:101] [0] [48] [F4CFE24334C1] [0] [*]/20
      172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.4:101] [0] [48] [F4CFE24334C1] [32] [10.1.101.11]/24
      172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.4:101] [0] [48] [F4CFE24334C1] [128] [FC00:1:101::11]/36
      172.16.254.3          0          100          0 ?
*>i [2] [172.16.254.4:101] [0] [48] [F4CFE24334C1] [128] [FE80::F6CF:E2FF:FE43:34C1]/36
      172.16.254.3          0          100          0 ?
Route Distinguisher: 172.16.254.4:102
*>i [2] [172.16.254.4:102] [0] [48] [0C75BD67EF4D] [32] [10.1.102.1]/24
      172.16.254.6          0          100          0 ?
*>i [2] [172.16.254.4:102] [0] [48] [0C75BD67EF4D] [128] [FC00:1:102::1]/36
      172.16.254.6          0          100          0 ?
*> [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [0] [*]/20
      ::                          32768 ?
*> [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [32] [10.1.102.12]/24
      ::                          32768 ?
*> [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [128] [FC00:1:102::12]/36
      ::                          32768 ?
*> [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [128] [FE80::46D3:CAFF:FE28:6CC5]/36
      ::                          32768 ?
*> [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [32] [10.1.102.1]/24
      ::                          32768 ?
*> [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [128] [FC00:1:102::1]/36
      ::                          32768 ?
*>i [2] [172.16.254.4:102] [0] [48] [ECE1A93792C5] [0] [*]/20
      172.16.254.6          0          100          0 ?
*>i [2] [172.16.254.4:102] [0] [48] [ECE1A93792C5] [32] [10.1.102.13]/24
      172.16.254.6          0          100          0 ?
*>i [2] [172.16.254.4:102] [0] [48] [ECE1A93792C5] [128] [FC00:1:102::13]/36
      172.16.254.6          0          100          0 ?
*>i [2] [172.16.254.4:102] [0] [48] [ECE1A93792C5] [128] [FE80::EEE1:A9FF:FE37:92C5]/36
      172.16.254.6          0          100          0 ?
Route Distinguisher: 172.16.254.6:102
*>i [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [32] [10.1.102.1]/24
      172.16.254.6          0          100          0 ?

```

例：エニーキャスト RP を使用した PIM スペースモードでの TRM の設定

```

* i          172.16.254.6          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [128] [FC00:1:102::1]/36
      172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [0] [*]/20
      172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [32] [10.1.102.13]/24
      172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FC00:1:102::13]/36
      172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FE80::EEE1:A9FF:FE37:92C5]/36
      172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
Route Distinguisher: 1:1 (default for vrf green)
*>i [5] [1:1] [0] [24] [10.1.101.0]/17
      172.16.254.3          0 100 0 ?
* i          172.16.254.3          0 100 0 ?
*> [5] [1:1] [0] [24] [10.1.102.0]/17
      0.0.0.0                0          32768 ?
*>i [5] [1:1] [0] [32] [10.1.255.1]/17
      172.16.254.3          0 100 0 ?
* i          172.16.254.3          0 100 0 ?
*> [5] [1:1] [0] [32] [10.1.255.2]/17
      0.0.0.0                0          32768 ?
*>i [5] [1:1] [0] [32] [10.1.255.3]/17
      172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
* i [5] [1:1] [0] [32] [10.2.255.255]/17
      172.16.254.3          0 100 0 ?
* i          172.16.254.3          0 100 0 ?
*> [5] [1:1] [0] [64] [FC00:1:101::]/29
      0.0.0.0                0          32768 ?
*>i [5] [1:1] [0] [64] [FC00:1:101::]/29
      172.16.254.3          0 100 0 ?
* i          172.16.254.3          0 100 0 ?
*> [5] [1:1] [0] [64] [FC00:1:102::]/29
      ::                    0          32768 ?
*>i [5] [1:1] [0] [128] [FC00:1:255::1]/29
      172.16.254.3          0 100 0 ?
* i          172.16.254.3          0 100 0 ?
*> [5] [1:1] [0] [128] [FC00:1:255::2]/29
      ::                    0          32768 ?
*>i [5] [1:1] [0] [128] [FC00:1:255::3]/29
      172.16.254.6          0 100 0 ?
* i          172.16.254.6          0 100 0 ?
* i [5] [1:1] [0] [128] [FC00:2:255::255]/29
      172.16.254.3          0 100 0 ?
* i          172.16.254.3          0 100 0 ?
*> [5] [1:1] [0] [128] [FC00:2:255::255]/29
      ::                    0          32768 ?
Leaf-02#

```

次に、VTEP 2 での **show ipv6 pim vrf vrf-name group-map** コマンドの出力例を示します。

```

Leaf-02# show ipv6 pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
  SM, RP: FC00:2:255::255

```

```
RPF: Tu2,FC00:2:255::255 (us)
Info source: Static
Uptime: 01:54:21, Groups: 1
Leaf-02#
```

次に、VTEP 2 での **show ipv6 route vrf** コマンドの出力例を示します。

```
Leaf-02# show ipv6 route vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "connected", distance 0, metric 0, type receive, connected
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    receive via Loopback255
    Last updated 01:54:21 ago
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                               Interface
      Uptime      Expires
FF06:1::1                                   Vlan102
      01:53:45   00:03:52
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 01:53:45/never, RP FC00:2:255::255, flags: SCJ
  Incoming interface: Tunnel2
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    Vlan102, Forward, 01:53:45/never

(FC00:1:101::11, FF06:1::1), 01:47:58/never, flags: STgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Inherited Outgoing interface list:
    Vlan102, Forward, 01:53:45/never
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mfib vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mfib vrf green
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```

ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,FF06:1::1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding:  0/0/0/0, Other: 0/0/0
Tunnel2 Flags: A NS
Vlan102 Flags: F NS
Pkts: 0/0/0   Rate: 0 pps
(FC00:1:101::11,FF06:1::1) Flags: HW
SW Forwarding: 1/0/100/0, Other: 0/0/0
HW Forwarding:  3225/0/126/0, Other: 0/0/0
Vlan901, VXLAN Decap Flags: A
Vlan102 Flags: F NS
Pkts: 0/0/1   Rate: 0 pps
Leaf-02#

```

次に、VTEP 2 での **show ip mroute** コマンドの出力例を示します。

```

Leaf-02# show 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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 01:54:12/stopped, RP 172.16.255.255, flags: SJCx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
Tunnel0, Forward/Sparse, 01:54:12/00:00:41

(172.16.254.3, 239.1.1.1), 01:47:56/00:02:39, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
Tunnel0, Forward/Sparse, 01:47:56/00:00:03

```

```
(*, 224.0.1.40), 01:54:21/00:02:39, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 01:54:20/00:02:39

(*, 225.0.0.102), 01:54:12/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:54:12/00:00:41

(172.16.254.6, 225.0.0.102), 01:53:36/00:00:58, flags: Tx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:53:36/00:00:41

(172.16.254.4, 225.0.0.102), 01:53:47/00:02:53, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 01:53:36/00:02:40, A

(*, 225.0.0.101), 01:54:12/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:54:12/00:00:41

(172.16.254.3, 225.0.0.101), 01:53:11/00:01:39, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:53:11/00:00:48
Leaf-02#
```

次に、VTEP 2 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-02# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```

HW Forwarding: 1/0/190/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
SW Forwarding: 1/0/172/0, Other: 0/0/0
HW Forwarding: 529/0/177/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
(*,225.0.0.102) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
SW Forwarding: 2/0/163/0, Other: 3/1/2
HW Forwarding: 631/0/163/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F
Pkts: 0/0/2 Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 530/0/205/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 1/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.3,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 3224/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
Leaf-02#

```

[IPv4 および IPv6 マルチキャストトラフィック用のエニーキャスト RP を使用した PIM-SM の TRM の確認 \(32 ページ\)](#) に戻ります。

VTEP 3 の設定を確認する出力

次に、VTEP 3 での **show nve peers** コマンドの出力例を示します。

```

Leaf-03# show nve peers

```

Interface	VNI	Type	Peer-IP	RMAC/Num_RTs	eVNI	state	flags	UP	time
nve1	50901	L3CP	172.16.254.3	10b3.d56a.8fc8	50901	UP	A/-/4	02:01:22	
nve1	50901	L3CP	172.16.254.4	7c21.0dbd.9548	50901	UP	A/-/4	02:01:22	
nve1	50901	L3CP	172.16.254.3	10b3.d56a.8fc8	50901	UP	A/M/6	02:01:22	
nve1	50901	L3CP	172.16.254.4	7c21.0dbd.9548	50901	UP	A/M/6	02:01:22	
nve1	10101	L2CP	172.16.254.3	7	10101	UP	N/A	02:01:22	
nve1	10102	L2CP	172.16.254.4	7	10102	UP	N/A	02:01:22	

```

Leaf-03#

```

次に、VTEP 3 での **show l2vpn evpn peers vxlan** コマンドの出力例を示します。

Leaf-03# **show l2vpn evpn peers vxlan**

Interface	VNI	Peer-IP	Num routes	eVNI	UP time
nve1	10101	172.16.254.3	7	10101	02:01:23
nve1	10102	172.16.254.4	7	10102	02:01:23

Leaf-03#

次に、VTEP 3 での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

Leaf-03# **show bgp ipv6 mvpn all summary**

```
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 5, main routing table version 5
2 network entries using 784 bytes of memory
3 path entries using 480 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 3904 total bytes of memory
BGP activity 66/0 prefixes, 97/0 paths, scan interval 60 secs
2 networks peaked at 11:29:08 Sep 16 2020 UTC (01:56:22.908 ago)
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	160	143	5	0	0	02:01:59	1
172.16.255.2	4	65001	159	142	5	0	0	02:01:59	1

Leaf-03#

次に、VTEP 3 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

Leaf-03# **show bgp ipv6 mvpn all**

```
BGP table version is 5, local router ID is 172.16.255.6
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)					
* i [5] [1:1] [FC00:1:101::11] [FF06:1::1]/42	172.16.255.3	0	100	0	?
*>i	172.16.255.3	0	100	0	?
Route Distinguisher: 172.16.254.3:101					
*> [7] [172.16.254.3:101] [65001] [FC00:1:101::11] [FF06:1::1]/46	::			32768	?

Leaf-03#

次に、VTEP 3 での **show bgp l2vpn evpn summary** コマンドの出力例を示します。

Leaf-03# **show bgp l2vpn evpn summary**

```
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 51, main routing table version 51
```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```
42 network entries using 16128 bytes of memory
68 path entries using 14416 bytes of memory
12/12 BGP path/bestpath attribute entries using 3456 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
14 BGP extended community entries using 1848 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 36032 total bytes of memory
BGP activity 66/0 prefixes, 97/0 paths, scan interval 60 secs
42 networks peaked at 11:24:07 Sep 16 2020 UTC (02:01:24.200 ago)
```

```
Neighbor      V          AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4          65001   160    143     51   0    0 02:02:00    22
172.16.255.2  4          65001   159    142     51   0    0 02:01:59    22
Leaf-03#
```

次に、VTEP 3 での **show bgp l2vpn evpn** コマンドの出力例を示します。

```
Leaf-03# show bgp l2vpn evpn
BGP table version is 51, local router ID is 172.16.255.6
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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: 172.16.254.3:101
*>i [2][172.16.254.3:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
      172.16.254.3          0    100    0 ?
* i      172.16.254.3          0    100    0 ?
*>i [2][172.16.254.3:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
      172.16.254.3          0    100    0 ?
      172.16.254.3          0    100    0 ?
*>i [2][172.16.254.3:101][0][48][F4CFE24334C1][0][*]/20
      172.16.254.3          0    100    0 ?
* i      172.16.254.3          0    100    0 ?
*>i [2][172.16.254.3:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
      172.16.254.3          0    100    0 ?
* i      172.16.254.3          0    100    0 ?
*>i [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
      172.16.254.3          0    100    0 ?
* i      172.16.254.3          0    100    0 ?
*>i [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FE80::F6CF:E2FF:FE43:34C1]/36
      172.16.254.3          0    100    0 ?
* i      172.16.254.3          0    100    0 ?
Route Distinguisher: 172.16.254.4:102
*>i [2][172.16.254.4:102][0][48][44D3CA286CC5][0][*]/20
      172.16.254.4          0    100    0 ?
* i      172.16.254.4          0    100    0 ?
*>i [2][172.16.254.4:102][0][48][44D3CA286CC5][32][10.1.102.12]/24
      172.16.254.4          0    100    0 ?
* i      172.16.254.4          0    100    0 ?
*>i [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FC00:1:102::12]/36
      172.16.254.4          0    100    0 ?
* i      172.16.254.4          0    100    0 ?
*>i [2][172.16.254.4:102][0][48][44D3CA286CC5][128][FE80::46D3:CAFF:FE28:6CC5]/36
      172.16.254.4          0    100    0 ?
* i      172.16.254.4          0    100    0 ?
*>i [2][172.16.254.4:102][0][48][7C210DBD954D][32][10.1.102.1]/24
```



```

172.16.254.4          0 100 0 ?
* i                  172.16.254.4          0 100 0 ?
*>i [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [128] [FC00:1:102::1]/36
172.16.254.4          0 100 0 ?
* i                  172.16.254.4          0 100 0 ?
Route Distinguisher: 172.16.254.6:101
*>i [2] [172.16.254.6:101] [0] [48] [10B3D56A8FC1] [32] [10.1.101.1]/24
172.16.254.3          0 100 0 ?
*>i [2] [172.16.254.6:101] [0] [48] [10B3D56A8FC1] [128] [FC00:1:101::1]/36
172.16.254.3          0 100 0 ?
*>i [2] [172.16.254.6:101] [0] [48] [F4CFE24334C1] [0] [*]/20
172.16.254.3          0 100 0 ?
*>i [2] [172.16.254.6:101] [0] [48] [F4CFE24334C1] [32] [10.1.101.11]/24
172.16.254.3          0 100 0 ?
*>i [2] [172.16.254.6:101] [0] [48] [F4CFE24334C1] [128] [FC00:1:101::11]/36
172.16.254.3          0 100 0 ?
*>i [2] [172.16.254.6:101] [0] [48] [F4CFE24334C1] [128] [FE80::F6CF:E2FF:FE43:34C1]/36
172.16.254.3          0 100 0 ?
Route Distinguisher: 172.16.254.6:102
*> [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [32] [10.1.102.1]/24
::                      32768 ?
*> [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [128] [FC00:1:102::1]/36
::                      32768 ?
*>i [2] [172.16.254.6:102] [0] [48] [44D3CA286CC5] [0] [*]/20
172.16.254.4          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [44D3CA286CC5] [32] [10.1.102.12]/24
172.16.254.4          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [44D3CA286CC5] [128] [FC00:1:102::12]/36
172.16.254.4          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [44D3CA286CC5] [128] [FE80::46D3:CAFF:FE28:6CC5]/36
172.16.254.4          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [7C210DBD954D] [32] [10.1.102.1]/24
172.16.254.4          0 100 0 ?
*>i [2] [172.16.254.6:102] [0] [48] [7C210DBD954D] [128] [FC00:1:102::1]/36
172.16.254.4          0 100 0 ?
*> [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [0] [*]/20
::                      32768 ?
*> [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [32] [10.1.102.13]/24
::                      32768 ?
*> [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FC00:1:102::13]/36
::                      32768 ?
*> [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FE80::EEE1:A9FF:FE37:92C5]/36
::                      32768 ?
Route Distinguisher: 1:1 (default for vrf green)
*>i [5] [1:1] [0] [24] [10.1.101.0]/17
172.16.254.3          0 100 0 ?
* i                  172.16.254.3          0 100 0 ?
* i [5] [1:1] [0] [24] [10.1.102.0]/17
172.16.254.4          0 100 0 ?
* i                  172.16.254.4          0 100 0 ?
*> 0.0.0.0            0 32768 ?
*>i [5] [1:1] [0] [32] [10.1.255.1]/17
172.16.254.3          0 100 0 ?
* i                  172.16.254.3          0 100 0 ?
*>i [5] [1:1] [0] [32] [10.1.255.2]/17
172.16.254.4          0 100 0 ?
* i                  172.16.254.4          0 100 0 ?
*> [5] [1:1] [0] [32] [10.1.255.3]/17
0.0.0.0              0 32768 ?
* i [5] [1:1] [0] [32] [10.2.255.255]/17
172.16.254.3          0 100 0 ?
* i                  172.16.254.3          0 100 0 ?
*> 0.0.0.0            0 32768 ?
*>i [5] [1:1] [0] [64] [FC00:1:101::]/29

```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```

          172.16.254.3          0    100    0 ?
* i          172.16.254.3          0    100    0 ?
* i [5][1:1][0][64][FC00:1:102::]/29
          172.16.254.4          0    100    0 ?
* i          172.16.254.4          0    100    0 ?
*>          ::                    0                32768 ?
*>i [5][1:1][0][128][FC00:1:255::1]/29
          172.16.254.3          0    100    0 ?
* i          172.16.254.3          0    100    0 ?
*>i [5][1:1][0][128][FC00:1:255::2]/29
          172.16.254.4          0    100    0 ?
* i          172.16.254.4          0    100    0 ?
*> [5][1:1][0][128][FC00:1:255::3]/29
          ::                    0                32768 ?
* i [5][1:1][0][128][FC00:2:255::255]/29
          172.16.254.3          0    100    0 ?
* i          172.16.254.3          0    100    0 ?
*>          ::                    0                32768 ?
Leaf-03#

```

次に、VTEP 3 での **show ipv6 pim vrfvrf-name group-map** コマンドの出力例を示します。

```

Leaf-03# show ipv6 pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
  SM, RP: FC00:2:255::255
  RPF: Tu2,FC00:2:255::255 (us)
  Info source: Static
  Uptime: 02:02:54, Groups: 1
Leaf-03#

```

次に、VTEP 3 での **show ipv6 route vrf** コマンドの出力例を示します。

```

Leaf-03# show ipv6 route vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "connected", distance 0, metric 0, type receive, connected
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    receive via Loopback255
    Last updated 02:02:55 ago
Leaf-03#

```

次に、VTEP 3 での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

```

Leaf-03# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                               Interface
      Uptime    Expires
FF06:1::1                               Vlan102
      02:02:06  00:03:50
Leaf-03#

```

次に、VTEP 3 での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-03# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 02:02:06/never, RP FC00:2:255::255, flags: SCJ
  Incoming interface: Tunnel2
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    Vlan102, Forward, 02:02:06/never

(FC00:1:101::11, FF06:1::1), 01:56:23/never, flags: STgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Inherited Outgoing interface list:
    Vlan102, Forward, 02:02:06/never
Leaf-03#
```

次に、VTEP 3 での `show ipv6 mfib vrf vrf-name` コマンドの出力例を示します。

```
Leaf-03# show ipv6 mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,FF06:1::1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnel2 Flags: A NS
  Vlan102 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(FC00:1:101::11,FF06:1::1) Flags: HW
  SW Forwarding: 1/0/100/0, Other: 0/0/0
  HW Forwarding:  3475/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan102 Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
Leaf-03#
```

次に、VTEP 3 での `show ip mroute` コマンドの出力例を示します。

```
Leaf-03# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 02:02:45/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:02:45/00:01:07

(172.16.254.3, 239.1.1.1), 01:56:21/00:02:07, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 01:56:21/00:00:37

(*, 224.0.1.40), 02:02:55/00:02:10, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback0, Forward/Sparse, 02:02:54/00:02:10

(*, 225.0.0.102), 02:02:45/stopped, RP 172.16.255.255, flags: SJCfX
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:02:45/00:01:07

(172.16.254.4, 225.0.0.102), 02:01:56/00:02:46, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:01:56/00:01:07

(172.16.254.6, 225.0.0.102), 02:02:08/00:02:37, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 02:01:58/00:02:59

(*, 225.0.0.101), 02:02:45/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:02:45/00:01:07

(172.16.254.3, 225.0.0.101), 02:01:36/00:01:06, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 02:01:36/00:01:23
Leaf-03#
```

次に、VTEP 3 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-03# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
                  e - Encap helper tunnel flag.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Tunnel0, VXLAN Decap Flags: NS
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Loopback0 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.0/8) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1/0/190/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 1/0/172/0, Other: 0/0/0
  HW Forwarding: 568/0/177/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1/0/172/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding: 632/0/176/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 2/0/180/0, Other: 3/0/3
  HW Forwarding: 610/0/189/0, Other: 0/0/0
  Null0 Flags: A
  TenGigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```

SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 1/0/168/0, Other: 0/0/0
TenGigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.3,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 3474/0/168/0, Other: 0/0/0
TenGigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
Leaf-03#

```

[IPv4 および IPv6 マルチキャストトラフィック用のエニーキャスト RP を使用した PIM-SM での TRM の確認 \(32 ページ\)](#) に戻ります。

スパインスイッチ 1 の設定を確認するための出力

次に、スパインスイッチ 1 での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```

Spine-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 20, main routing table version 20
2 network entries using 784 bytes of memory
5 path entries using 800 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
3 BGP rinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
13 BGP extended community entries using 1808 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4144 total bytes of memory
BGP activity 1001/969 prefixes, 7359/7288 paths, scan interval 60 secs
2 networks peaked at 11:16:15 Sep 16 2020 UTC (02:20:36.059 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.2  4      65001   161    167     20   0    0 02:07:55      2
172.16.255.3  4      65001   148    161     20   0    0 02:08:00      1
172.16.255.4  4      65001   148    165     20   0    0 02:07:32      1
172.16.255.6  4      65001   149    166     20   0    0 02:07:32      1
Spine-01#

```

次に、スパインスイッチ 1 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```

Spine-01# show bgp ipv6 mvpn all
BGP table version is 20, local router ID is 172.16.255.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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

```

```
* i [5][1:1][FC00:1:101::11][FF06:1::1]/42
      172.16.255.3          0    100    0 ?
*>i      172.16.255.3          0    100    0 ?
Route Distinguisher: 172.16.254.3:101
* i [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
      172.16.255.4          0    100    0 ?
*>i      172.16.255.4          0    100    0 ?
* i      172.16.255.6          0    100    0 ?
Spine-01#
```

次に、スパインスイッチ 1 での **show bgp l2vpn evpn summary** コマンドの出力例を示します。

```
Spine-01# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 785, main routing table version 785
30 network entries using 10320 bytes of memory
66 path entries using 13728 bytes of memory
11/11 BGP path/bestpath attribute entries using 3168 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
13 BGP extended community entries using 1808 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 29168 total bytes of memory
BGP activity 1001/969 prefixes, 7359/7288 paths, scan interval 60 secs
44 networks peaked at 10:13:07 Aug 6 2020 UTC (5w6d ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.2  4      65001   161    167     785   0    0 02:07:55    30
172.16.255.3  4      65001   148    161     785   0    0 02:08:00    12
172.16.255.4  4      65001   148    165     785   0    0 02:07:33    12
172.16.255.6  4      65001   149    166     785   0    0 02:07:33    12
Spine-01#
```

次に、スパインスイッチ 1 での **show bgp l2vpn evpn** コマンドの出力例を示します。

```
Spine-01# show bgp l2vpn evpn
BGP table version is 785, local router ID is 172.16.255.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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: 172.16.254.3:101
* i [2][172.16.254.3:101][0][48][10B3D56A8FC1][32][10.1.101.1]/24
      172.16.254.3          0    100    0 ?
*>i      172.16.254.3          0    100    0 ?
* i [2][172.16.254.3:101][0][48][10B3D56A8FC1][128][FC00:1:101::1]/36
      172.16.254.3          0    100    0 ?
*>i      172.16.254.3          0    100    0 ?
* i [2][172.16.254.3:101][0][48][F4CFE24334C1][0][*]/20
      172.16.254.3          0    100    0 ?
*>i      172.16.254.3          0    100    0 ?
* i [2][172.16.254.3:101][0][48][F4CFE24334C1][32][10.1.101.11]/24
      172.16.254.3          0    100    0 ?
*>i      172.16.254.3          0    100    0 ?
* i [2][172.16.254.3:101][0][48][F4CFE24334C1][128][FC00:1:101::11]/36
      172.16.254.3          0    100    0 ?
```

例：エニーキャストRPを使用したPIMスパースモードでのTRMの設定

```

*>i          172.16.254.3          0    100    0 ?
* i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [128] [FE80::F6CF:E2FF:FE43:34C1]/36
          172.16.254.3          0    100    0 ?
*>i          172.16.254.3          0    100    0 ?
Route Distinguisher: 172.16.254.4:102
* i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [0] [*]/20
          172.16.254.4          0    100    0 ?
*>i          172.16.254.4          0    100    0 ?
* i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [32] [10.1.102.12]/24
          172.16.254.4          0    100    0 ?
*>i          172.16.254.4          0    100    0 ?
* i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [128] [FC00:1:102::12]/36
          172.16.254.4          0    100    0 ?
*>i          172.16.254.4          0    100    0 ?
* i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [128] [FE80::46D3:CAFF:FE28:6CC5]/36
          172.16.254.4          0    100    0 ?
*>i          172.16.254.4          0    100    0 ?
* i [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [32] [10.1.102.1]/24
          172.16.254.4          0    100    0 ?
*>i          172.16.254.4          0    100    0 ?
* i [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [128] [FC00:1:102::1]/36
          172.16.254.4          0    100    0 ?
*>i          172.16.254.4          0    100    0 ?
Route Distinguisher: 172.16.254.6:102
* i [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [32] [10.1.102.1]/24
          172.16.254.6          0    100    0 ?
*>i          172.16.254.6          0    100    0 ?
* i [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [128] [FC00:1:102::1]/36
          172.16.254.6          0    100    0 ?
*>i          172.16.254.6          0    100    0 ?
* i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [0] [*]/20
          172.16.254.6          0    100    0 ?
*>i          172.16.254.6          0    100    0 ?
* i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [32] [10.1.102.13]/24
          172.16.254.6          0    100    0 ?
*>i          172.16.254.6          0    100    0 ?
* i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FC00:1:102::13]/36
          172.16.254.6          0    100    0 ?
*>i          172.16.254.6          0    100    0 ?
* i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FE80::EEE1:A9FF:FE37:92C5]/36
          172.16.254.6          0    100    0 ?
*>i          172.16.254.6          0    100    0 ?
Route Distinguisher: 1:1
* i [5] [1:1] [0] [24] [10.1.101.0]/17
          172.16.254.3          0    100    0 ?
*>i          172.16.254.3          0    100    0 ?
*>i [5] [1:1] [0] [24] [10.1.102.0]/17
          172.16.254.4          0    100    0 ?
* i          172.16.254.4          0    100    0 ?
* i          172.16.254.6          0    100    0 ?
* i [5] [1:1] [0] [32] [10.1.255.1]/17
          172.16.254.3          0    100    0 ?
*>i          172.16.254.3          0    100    0 ?
* i [5] [1:1] [0] [32] [10.1.255.2]/17
          172.16.254.4          0    100    0 ?
*>i          172.16.254.4          0    100    0 ?
* i [5] [1:1] [0] [32] [10.1.255.3]/17
          172.16.254.6          0    100    0 ?
*>i          172.16.254.6          0    100    0 ?
* i [5] [1:1] [0] [32] [10.2.255.255]/17
          172.16.254.4          0    100    0 ?
* i          172.16.254.6          0    100    0 ?
* i          172.16.254.3          0    100    0 ?
*>i          172.16.254.3          0    100    0 ?

```



```

* i [5][1:1][0][64][FC00:1:101::]/29
    172.16.254.3 0 100 0 ?
*>i 172.16.254.3 0 100 0 ?
*>i [5][1:1][0][64][FC00:1:102::]/29
    172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
* i 172.16.254.6 0 100 0 ?
* i [5][1:1][0][128][FC00:1:255::1]/29
    172.16.254.3 0 100 0 ?
*>i 172.16.254.3 0 100 0 ?
* i [5][1:1][0][128][FC00:1:255::2]/29
    172.16.254.4 0 100 0 ?
*>i 172.16.254.4 0 100 0 ?
* i [5][1:1][0][128][FC00:1:255::3]/29
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
* i [5][1:1][0][128][FC00:2:255::255]/29
    172.16.254.4 0 100 0 ?
* i 172.16.254.6 0 100 0 ?
* i 172.16.254.3 0 100 0 ?
*>i 172.16.254.3 0 100 0 ?
Spine-01#

```

次に、スパインスイッチ 1 での `show ip pim rp mapping` コマンドの出力例を示します。

```

Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)
Spine-01#

```

次に、スパインスイッチ 1 での `show ip mroute` コマンドの出力例を示します。

```

Spine-01# show 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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 224.0.1.40), 1w2d/00:02:38, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w2d/00:02:38

(*, 225.0.0.102), 1w2d/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```
(172.16.254.4, 225.0.0.102), 02:04:11/00:02:37, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(172.16.254.6, 225.0.0.102), 02:07:34/00:00:34, flags: PTA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null
Spine-01#
```

次に、スパインスイッチ 1 での **show ip mfib** コマンドの出力例を示します。

```
Spine-01# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 84/84/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  Loopback2 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 4/0/193/0, Other: 41/0/41
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  GigabitEthernet1/0/2 Flags: NS
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/206/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  GigabitEthernet1/0/4 Flags: A NS
(*,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
Spine-01#
```

[IPv4 および IPv6 マルチキャストトラフィック用のエニーキャスト RP を使用した PIM-SM での TRM の確認 \(32 ページ\)](#) に戻ります。

スパインスイッチ 2 の設定を確認するための出力

次に、スパインスイッチ 2 での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Spine-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 20, main routing table version 20
2 network entries using 784 bytes of memory
5 path entries using 800 bytes of memory
2/2 BGP path/bestpath attribute entries using 608 bytes of memory
3 BGP rrrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
13 BGP extended community entries using 1808 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4144 total bytes of memory
BGP activity 1031/999 prefixes, 7443/7372 paths, scan interval 60 secs
2 networks peaked at 11:17:12 Sep 16 2020 UTC (02:22:21.833 ago)

Neighbor      V      AS MsgRcvd  MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001    169     163      20    0    0 02:09:41      2
172.16.255.3  4      65001    150     169      20    0    0 02:09:38      1
172.16.255.4  4      65001    151     168      20    0    0 02:09:14      1
172.16.255.6  4      65001    150     167      20    0    0 02:09:18      1
Spine-02#
```

次に、スパインスイッチ 2 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```
Spine-02# show bgp ipv6 mvpn all
BGP table version is 20, local router ID is 172.16.255.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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
* i   [5][1:1][FC00:1:101::11][FF06:1::1]/42
      172.16.255.3          0    100    0 ?
*>i   172.16.255.3          0    100    0 ?
Route Distinguisher: 172.16.254.3:101
*>i   [7][172.16.254.3:101][65001][FC00:1:101::11][FF06:1::1]/46
      172.16.255.4          0    100    0 ?
* i   172.16.255.4          0    100    0 ?
* i   172.16.255.6          0    100    0 ?
Spine-02#
```

次に、スパインスイッチ 2 での **show bgp l2vpn evpn summary** コマンドの出力例を示します。

```
Spine-02# show bgp l2vpn evpn summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 712, main routing table version 712
30 network entries using 10320 bytes of memory
66 path entries using 13728 bytes of memory
11/11 BGP path/bestpath attribute entries using 3168 bytes of memory
```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```

3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
13 BGP extended community entries using 1808 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 29168 total bytes of memory
BGP activity 1031/999 prefixes, 7443/7372 paths, scan interval 60 secs
44 networks peaked at 10:13:54 Aug 6 2020 UTC (5w6d ago)

```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
172.16.255.1	4	65001	169	163	712	0	0	02:09:41	30
172.16.255.3	4	65001	150	169	712	0	0	02:09:38	12
172.16.255.4	4	65001	151	168	712	0	0	02:09:15	12
172.16.255.6	4	65001	150	167	712	0	0	02:09:18	12

Spine-02#

次に、スパインスイッチ 2 での `show bgp l2vpn evpn` コマンドの出力例を示します。

```

Spine-02# show bgp l2vpn evpn
BGP table version is 712, local router ID is 172.16.255.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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: 172.16.254.3:101
* i [2] [172.16.254.3:101] [0] [48] [10B3D56A8FC1] [32] [10.1.101.1]/24
      172.16.254.3          0      100      0 ?
*>i      172.16.254.3          0      100      0 ?
* i [2] [172.16.254.3:101] [0] [48] [10B3D56A8FC1] [128] [FC00:1:101::1]/36
      172.16.254.3          0      100      0 ?
*>i      172.16.254.3          0      100      0 ?
* i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [0] [*]/20
      172.16.254.3          0      100      0 ?
*>i      172.16.254.3          0      100      0 ?
* i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [32] [10.1.101.11]/24
      172.16.254.3          0      100      0 ?
*>i      172.16.254.3          0      100      0 ?
* i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [128] [FC00:1:101::11]/36
      172.16.254.3          0      100      0 ?
*>i      172.16.254.3          0      100      0 ?
* i [2] [172.16.254.3:101] [0] [48] [F4CFE24334C1] [128] [FE80::F6CF:E2FF:FE43:34C1]/36
      172.16.254.3          0      100      0 ?
*>i      172.16.254.3          0      100      0 ?
Route Distinguisher: 172.16.254.4:102
* i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [0] [*]/20
      172.16.254.4          0      100      0 ?
*>i      172.16.254.4          0      100      0 ?
* i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [32] [10.1.102.12]/24
      172.16.254.4          0      100      0 ?
*>i      172.16.254.4          0      100      0 ?
* i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [128] [FC00:1:102::12]/36
      172.16.254.4          0      100      0 ?
*>i      172.16.254.4          0      100      0 ?
* i [2] [172.16.254.4:102] [0] [48] [44D3CA286CC5] [128] [FE80::46D3:CAFF:FE28:6CC5]/36
      172.16.254.4          0      100      0 ?
*>i      172.16.254.4          0      100      0 ?
* i [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [32] [10.1.102.1]/24
      172.16.254.4          0      100      0 ?
*>i      172.16.254.4          0      100      0 ?

```

```

* i [2] [172.16.254.4:102] [0] [48] [7C210DBD954D] [128] [FC00:1:102::1]/36
    172.16.254.4 0 100 0 ?
*>i 172.16.254.4 0 100 0 ?
Route Distinguisher: 172.16.254.6:102
* i [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [32] [10.1.102.1]/24
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
* i [2] [172.16.254.6:102] [0] [48] [0C75BD67EF4D] [128] [FC00:1:102::1]/36
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
* i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [0] [*]/20
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
* i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [32] [10.1.102.13]/24
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
* i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FC00:1:102::13]/36
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
* i [2] [172.16.254.6:102] [0] [48] [ECE1A93792C5] [128] [FE80::EEE1:A9FF:FE37:92C5]/36
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
Route Distinguisher: 1:1
* i [5] [1:1] [0] [24] [10.1.101.0]/17
    172.16.254.3 0 100 0 ?
*>i 172.16.254.3 0 100 0 ?
*>i [5] [1:1] [0] [24] [10.1.102.0]/17
    172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
* i 172.16.254.6 0 100 0 ?
* i [5] [1:1] [0] [32] [10.1.255.1]/17
    172.16.254.3 0 100 0 ?
*>i 172.16.254.3 0 100 0 ?
* i [5] [1:1] [0] [32] [10.1.255.2]/17
    172.16.254.4 0 100 0 ?
*>i 172.16.254.4 0 100 0 ?
* i [5] [1:1] [0] [32] [10.1.255.3]/17
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
* i [5] [1:1] [0] [32] [10.2.255.255]/17
    172.16.254.4 0 100 0 ?
* i 172.16.254.6 0 100 0 ?
* i 172.16.254.3 0 100 0 ?
*>i 172.16.254.3 0 100 0 ?
* i [5] [1:1] [0] [64] [FC00:1:101::]/29
    172.16.254.3 0 100 0 ?
*>i 172.16.254.3 0 100 0 ?
*>i [5] [1:1] [0] [64] [FC00:1:102::]/29
    172.16.254.4 0 100 0 ?
* i 172.16.254.4 0 100 0 ?
* i 172.16.254.6 0 100 0 ?
* i [5] [1:1] [0] [128] [FC00:1:255::1]/29
    172.16.254.3 0 100 0 ?
*>i 172.16.254.3 0 100 0 ?
* i [5] [1:1] [0] [128] [FC00:1:255::2]/29
    172.16.254.4 0 100 0 ?
*>i 172.16.254.4 0 100 0 ?
* i [5] [1:1] [0] [128] [FC00:1:255::3]/29
    172.16.254.6 0 100 0 ?
*>i 172.16.254.6 0 100 0 ?
* i [5] [1:1] [0] [128] [FC00:2:255::255]/29
    172.16.254.4 0 100 0 ?
* i 172.16.254.6 0 100 0 ?
* i 172.16.254.3 0 100 0 ?

```

例：エニーキャスト RP を使用した PIM スパースモードでの TRM の設定

```
*>i          172.16.254.3          0    100    0 ?
Spine-02#
```

次に、スパインスイッチ 2 での **show ip pim rp mapping** コマンドの出力例を示します。

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)
Spine-02#
```

次に、スパインスイッチ 2 での **show ip mroute** コマンドの出力例を示します。

```
Spine-02# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 22:51:54/00:03:26, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:47/00:03:26
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:20/00:02:34
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:12

(172.16.254.3, 239.1.1.1), 02:03:40/00:02:43, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 02:03:40/00:03:12
    GigabitEthernet1/0/2, Forward/Sparse, 02:03:40/00:02:46

(*, 224.0.1.40), 1w2d/00:03:18, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:02:09/00:03:18
    GigabitEthernet1/0/1, Forward/Sparse, 00:02:10/00:03:17
    Loopback2, Forward/Sparse, 1w2d/00:02:45

(*, 225.0.0.102), 1w2d/00:03:22, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:47/00:02:35
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:20/00:03:16
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:22

(172.16.254.6, 225.0.0.102), 02:09:47/00:01:33, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
```

```

Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 02:09:16/00:03:16
  GigabitEthernet1/0/1, Forward/Sparse, 02:09:16/00:03:05

(172.16.254.4, 225.0.0.102), 02:09:47/00:02:06, flags: MT
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:19/00:03:10
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:22

(*, 225.0.0.101), 1w2d/00:03:29, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 02:09:47/00:03:29
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:20/00:02:31
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:29

(172.16.254.3, 225.0.0.101), 02:09:22/00:03:25, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 02:09:20/00:02:39
    GigabitEthernet1/0/4, Forward/Sparse, 02:09:16/00:03:29
Spine-02#

```

次に、スパインスイッチ 2 での **show ip mfib** コマンドの出力例を示します。

```

Spine-02# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
              ET - Data Rate Exceeds Threshold, K - Keepalive
              DDE - Data Driven Event, HW - Hardware Installed
              ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
              MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
              MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 1/1/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
Loopback2 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 2/0/140/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps

```

例：エニーキャスト RP を使用した PIM スペースモードでの TRM の設定

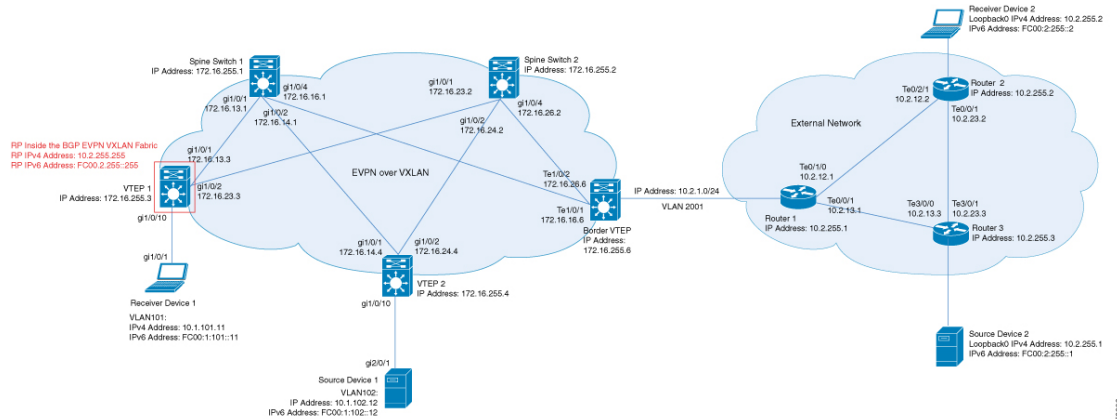
```
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 604/0/178/0, Other: 0/0/0
GigabitEthernet1/0/1 Flags: A NS
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
SW Forwarding: 4/0/124/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 668/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 600/0/205/0, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 17/0/397/0, Other: 4/4/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 3693/0/168/0, Other: 0/0/0
GigabitEthernet1/0/1 Flags: A
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
Spine-02#
```

[IPv4 および IPv6 マルチキャストトラフィック用のエニーキャスト RP を使用した PIM-SM での TRM の確認 \(32 ページ\)](#) に戻ります。

例：RPがBGP EVPN VXLAN ファブリック内にある場合の IPv4 マルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

次に、RPがBGP EVPN VXLANファブリック内にある場合に、IPv4マルチキャストトラフィックに対してPIM-SMを使用してレイヤ3 TRMを設定および確認する例を示します。この例では、次のトポロジを使用します。

図 11：RPがBGP EVPN VXLAN ファブリック内にある場合の PIM-SM での TRM



このトポロジには2台のスパインスイッチと、3台のルータで外部ネットワークに接続された3台のVTEPを備えたEVPN VXLANネットワークが示されています。BGP EVPN VXLANファブリック内のVTEP 1はこのトポロジでRPとして機能し、ボーダーVTEPはルータ1を介してファブリックを外部ネットワークに接続します。このトポロジでは、IPv4マルチキャストグループは226.1.1.1です。次の表に、このトポロジのデバイスの設定例を示します。

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 3: RPがBGP EVPN VXLAN ファブリック内にある場合にIPv4マルチキャストトラフィックに対してPIM-SMを使用してTRMを設定するためのVTEP 1、ボーダーVTEP、およびVTEP 2の設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre>Leaf-01# show running-config hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0</pre>	<pre>Border# show running-config hostname Border ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! vlan 2001 !</pre>	<pre>Leaf-02# show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-famil ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>

VTEP 1	ボーダー VTEP	VTEP 2
<pre> ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate ! </pre>	<pre> interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/2 no switchport ip address 172.16.26.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/5 switchport trunk allowed vlan 2001 switchport mode trunk ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate ! </pre>	<pre> interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 102 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate </pre>

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre> interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family </pre>	<pre> interface Vlan2001 vrf forwarding green ip address 10.2.1.1 255.255.255.0 ip mtu 1500 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 2 vrf green redistribute bgp 65001 ! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family </pre>	<pre> ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! </pre>

VTEP 1	ボーダー VTEP	VTEP 2
<pre> ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Leaf-01# </pre>	<pre> ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static redistribute ospf 2 match internal external 1 external 2 exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Border# </pre>	<pre> address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Leaf-02# </pre>

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 4: RPがBGP EVPN VXLANファブリック内にある場合にIPv4マルチキャストトラフィックに対してPIM-SMを使用してTRMを設定するためのスパインスイッチ1およびスパインスイッチ2の設定

スパインスイッチ 1	スパインスイッチ 2

スパインスイッチ1	スパインスイッチ2
	<pre> Spine-02# show running-config hostname Spine-02 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.26.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.2 ! router bgp 65001 bgp router-id 172.16.255.2 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! </pre>

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

スパインスイッチ1	スパインスイッチ2
<pre> Spine-01# show running-config hostname Spine-01 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.14.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.16.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.1 ! router bgp 65001 bgp router-id 172.16.255.1 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 </pre>	

スパインスイッチ1	スパインスイッチ2
<pre> ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-01# </pre>	<pre> ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-02# </pre>

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 5: RPがBGP EVPN VXLAN ファブリック内にある場合にIPv4マルチキャストトラフィックに対してPIM-SMを使用してTRMを設定するためのルータ1、ルータ2、およびルータ3の設定

ルータ 1	ルータ 2	ルータ 3
<pre> Router-01# show running-config hostname R1 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet0/0/1.2001 encapsulation dot1Q 2001 ip address 10.2.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 router ospf 1 router-id 10.2.255.1 ! ip pim rp-address 10.2.255.255 ! end ! R1# </pre>	<pre> Router-02# show running-config hostname R2 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.2 255.255.255.255 ip pim sparse-mode ip igmp join-group 226.1.1.1 ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 10.2.255.2 ! ip pim rp-address 10.2.255.255 ! end ! R2# </pre>	<pre> Router-03# show running-config hostname R3 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 10.2.255.3 ! ip pim rp-address 10.2.255.255 ! end ! R3# </pre>

RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認

次の項では、上記で設定したトポロジのデバイスでPIM-SMを使用してTRMを確認するshowコマンドの出力例を示します。

- VTEP 1 (BGP EVPN VXLAN ファブリック内に RP) の設定を確認するための出力 (75 ページ)
- VTEP 2 の設定を確認する出力 (81 ページ)
- ボーダー VTEP の設定を確認する出力 (86 ページ)
- スパインスイッチ 1 の設定を確認するための出力 (92 ページ)
- スパインスイッチ 2 の設定を確認するための出力 (95 ページ)

VTEP 1 (BGP EVPN VXLAN ファブリック内に RP) の設定を確認するための出力

次に、VTEP 1 での `show nve peers` コマンドの出力例を示します。

```
Leaf-01# show nve peers
Interface VNI      Type Peer-IP          RMAC/Num_RTs  eVNI      state flags UP time
nve1      50901    L3CP 172.16.254.6  0c75.bd67.ef48 50901      UP  A/-/4 1d05h
nve1      50901    L3CP 172.16.254.4  7c21.0dbd.9548 50901      UP  A/-/4 1d05h
nve1      50901    L3CP 172.16.254.6  0c75.bd67.ef48 50901      UP  A/M/6 1d05h
nve1      50901    L3CP 172.16.254.4  7c21.0dbd.9548 50901      UP  A/M/6 1d05h
nve1      10102    L2CP 172.16.254.4    7           10102      UP  N/A 1d05h
nve1      10102    L2CP 172.16.254.6    5           10102      UP  N/A 1d05h
Leaf-01#
```

次に、VTEP 1 での `show l2vpn evpn peers vxlan` コマンドの出力例を示します。

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP          Num routes eVNI      UP time
-----
nve1      10102    172.16.254.4    7         10102    1d05h
nve1      10102    172.16.254.6    5         10102    1d05h
Leaf-01#
```

次に、VTEP 1 での `show bgp ipv4 mvpn all summary` コマンドの出力例を示します。

```
Leaf-01# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 111, main routing table version 111
7 network entries using 2128 bytes of memory
9 path entries using 1224 bytes of memory
5/5 BGP path/bestpath attribute entries using 1560 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
18 BGP extended community entries using 2396 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7492 total bytes of memory
BGP activity 140/45 prefixes, 240/112 paths, scan interval 60 secs
9 networks peaked at 12:22:24 Aug 6 2020 UTC (1d05h ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   2104   1988    111   0    0 1d05h    2
172.16.255.2  4      65001   2099   1988    111   0    0 1d05h    2
Leaf-01#
```

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

次に、VTEP 1 での **show ip pim vrf vrf-name rp mapping** コマンドの出力例を示します。

```
Leaf-01# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 10.2.255.255 (?)
Leaf-01#
```

次に、VTEP 1 での **show ip routing vrf** コマンドの出力例を示します。

```
Leaf-01# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "connected", distance 0, metric 0 (connected, via interface)
  Redistributing via bgp 65001
  Advertised by bgp 65001
  Routing Descriptor Blocks:
    * directly connected, via Loopback255
      Route metric is 0, traffic share count is 1
Leaf-01#
```

次に、VTEP 1 での **show ip igmp vrf vrf-namegroups** コマンドの出力例を示します。

```
Leaf-01# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address      Interface          Uptime    Expires    Last Reporter    Group
Accounted
226.1.1.1          Vlan102           1d05h    00:02:50   10.1.102.12
224.0.1.40         Vlan901           1d05h    00:02:03   172.16.254.4
Leaf-01#
```

次に、VTEP 1 での **show ip mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-01# show ip mroute vrf green
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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 1d01h/stopped, RP 10.2.255.255, flags: SJCGx
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan101, Forward/Sparse, 1d01h/00:02:33
    Vlan901, Forward/Sparse, 03:54:15/stopped
```

```
(10.2.255.1, 226.1.1.1), 00:01:13/00:01:50, flags: Tgx
Incoming interface: Vlan901, RPF nbr 172.16.254.6
Outgoing interface list:
  Vlan101, Forward/Sparse, 00:01:13/00:02:33

(10.1.102.12, 226.1.1.1), 00:01:36/00:01:24, flags: Tgx
Incoming interface: Vlan901, RPF nbr 172.16.254.4
Outgoing interface list:
  Vlan101, Forward/Sparse, 00:01:36/00:02:33

(*, 224.0.1.40), 1d05h/00:02:09, RP 10.2.255.255, flags: SJCLGx
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  Loopback901, Forward/Sparse, 1d05h/00:02:09
  Vlan901, Forward/Sparse, 03:54:15/stopped
Leaf-01#
```

次に、VTEP 1 での `show ip mfib vrf vrf-name` コマンドの出力例を示します。

```
Leaf-01# show ip mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 2/2/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnel6 Flags: A
Loopback901 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
  Pkts: 0/0/0   Rate: 0 pps
(*,226.1.1.1) Flags: C HW
  SW Forwarding: 1/0/100/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnel6 Flags: A
Vlan101 Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
  Pkts: 0/0/1   Rate: 0 pps
(10.1.102.12,226.1.1.1) Flags: HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding: 44/0/126/0, Other: 0/0/0
Vlan901, VXLAN Decap Flags: A
Vlan101 Flags: F NS
  Pkts: 0/0/2   Rate: 0 pps
```

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
(10.2.255.1,226.1.1.1) Flags: HW
SW Forwarding: 5/0/100/0, Other: 12576/1/12575
HW Forwarding: 3801/1/126/0, Other: 0/0/0
Vlan901, VXLAN Decap Flags: A
Vlan901 Flags: SP
Vlan101 Flags: F NS
Pkts: 0/0/5 Rate: 0 pps
Leaf-01#
```

次に、VTEP 1 での **show bgp ipv4 mvpn all** コマンドの出力例を示します。

```
Leaf-01# show bgp ipv4 mvpn all
BGP table version is 94, local router ID is 172.16.255.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
* i   [5][1:1][10.1.102.12][226.1.1.1]/18
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
*>i   [5][1:1][10.2.255.1][226.1.1.1]/18
      172.16.255.6          0      100      0 ?
* i   172.16.255.6          0      100      0 ?
* i   [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
*>   [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
      0.0.0.0                32768 ?
Route Distinguisher: 172.16.254.4:102
*>   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
      0.0.0.0                32768 ?
Leaf-01#
```

次に、VTEP 1 での **show ip mroute** コマンドの出力例を示します。

```
Leaf-01# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

```
(*, 239.1.1.1), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:10

(172.16.254.6, 239.1.1.1), 00:01:11/00:01:48, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:01:11/00:01:48

(172.16.254.3, 239.1.1.1), 00:01:37/00:01:22, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0, Registering
Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:01:37/00:02:51, A

(172.16.254.4, 239.1.1.1), 04:17:32/00:02:31, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:17:32/00:00:27

(*, 224.0.1.40), 1d05h/00:02:12, RP 172.16.255.255, flags: SJCL
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:12

(*, 225.0.0.102), 1d05h/stopped, RP 172.16.255.255, flags: SJCx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:10

(172.16.254.4, 225.0.0.102), 1d05h/00:01:20, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:32

(172.16.254.6, 225.0.0.102), 1d05h/00:02:44, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:10

(*, 225.0.0.101), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:10

(172.16.254.3, 225.0.0.101), 1d05h/00:02:36, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0
Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:03:20
Leaf-01#
```

次に、VTEP 1 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-01# show ip mfib
Entry Flags:    C - Directly Connected, S - Signal, IA - Inherit A flag,
                ET - Data Rate Exceeds Threshold, K - Keepalive
                DDE - Data Driven Event, HW - Hardware Installed
                ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
                e - Encap helper tunnel flag.
```

例: RP が BGP EVPN VXLAN ファブリック内にある場合の IPv4 マルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

```

I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1/0/114/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 13/0/127/0, Other: 2/2/0
  HW Forwarding: 12525/0/165/0, Other: 0/0/0
  Null0 Flags: A
  GigabitEthernet1/0/2 Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 2/0/172/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding: 9155/0/176/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding: 3762/0/163/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 2/2/0
  HW Forwarding: 15/0/168/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,239.1.1.1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 2/1/1
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Null0 Flags: A
  GigabitEthernet1/0/2 Flags: F
    Pkts: 0/0/0   Rate: 0 pps

```



```
Tunnel4 Flags: F
  Pkts: 0/0/0    Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
  SW Forwarding: 1/0/150/0, Other: 0/0/0
  HW Forwarding: 7707/0/167/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1    Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
  SW Forwarding: 2/0/150/0, Other: 0/0/0
  HW Forwarding: 68/1/168/1, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/2    Rate: 0 pps
Leaf-01#
```

RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4 マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (74 ページ) に戻ります。

VTEP 2 の設定を確認する出力

次に、VTEP 2 での **show nve peers** コマンドの出力例を示します。

```
Leaf-02# show nve peers
Interface VNI      Type Peer-IP          RMAC/Num_RTs  eVNI      state flags UP time
nve1      50901    L3CP 172.16.254.6    0c75.bd67.ef48 50901     UP  A/-/4 1d05h
nve1      50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901     UP  A/-/4 1d05h
nve1      50901    L3CP 172.16.254.6     0c75.bd67.ef48 50901     UP  A/M/6 1d05h
nve1      50901    L3CP 172.16.254.3     10b3.d56a.8fc8 50901     UP  A/M/6 1d05h
nve1      10101    L2CP 172.16.254.3      6              10101     UP  N/A   1d05h
nve1      10102    L2CP 172.16.254.6      5              10102     UP  N/A   1d05h
Leaf-02#
```

次に、VTEP 2 での **show l2vpn evpn peers vxlan** コマンドの出力例を示します。

```
Leaf-02# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP          Num routes eVNI      UP time
-----
nve1      10101    172.16.254.3    6          10101    1d05h
nve1      10102    172.16.254.6    5          10102    1d05h
Leaf-02#
```

次に、VTEP 2 での **show bgp ipv4 mvpn all summary** コマンドの出力例を示します。

```
Leaf-02# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 62, main routing table version 62
7 network entries using 2128 bytes of memory
9 path entries using 1224 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7156 total bytes of memory
BGP activity 121/28 prefixes, 202/77 paths, scan interval 60 secs
9 networks peaked at 12:22:24 Aug 6 2020 UTC (16:43:21.423 ago)
```

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Neighbor      V          AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4          65001   1229   1151     62   0    0 16:57:50      2
172.16.255.2  4          65001   1227   1152     62   0    0 16:57:51      2
Leaf-02#
```

次に、VTEP 2 での **show ip pim vrf vrf-name rp mapping** コマンドの出力例を示します。

```
Leaf-02# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 10.2.255.255 (?)
Leaf-02#
```

次に、VTEP 2 での **show ip routing vrf** コマンドの出力例を示します。

```
Leaf-02# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "bgp 65001", distance 200, metric 0, type internal
  Last update from 172.16.254.3 on Vlan901, 03:59:59 ago
  Routing Descriptor Blocks:
  * 172.16.254.3 (default), from 172.16.255.1, 03:59:59 ago, via Vlan901
    opaque_ptr 0x7F65B8B9E9F0
    Route metric is 0, traffic share count is 1
    AS Hops 0
    MPLS label: none
Leaf-02#
```

次に、VTEP 2 での **show ip igmp vrf vrf-namegroups** コマンドの出力例を示します。

```
Leaf-02# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address      Interface          Uptime      Expires      Last Reporter      Group
Accounted
226.1.1.1          Vlan102           16:58:00    00:02:11    10.1.102.12
224.0.1.40         Vlan901           16:58:37    00:02:33    172.16.254.4
Leaf-02#
```

次に、VTEP 2 での **show ip mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ip mroute vrf green
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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
```

```

Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 1d05h/stopped, RP 10.2.255.255, flags: SJCFg
  Incoming interface: Vlan901, RPF nbr 172.16.254.3
  Outgoing interface list:
    Vlan102, Forward/Sparse, 1d05h/00:02:50

(10.2.255.1, 226.1.1.1), 00:06:57/00:02:09, flags: TgQ
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan102, Forward/Sparse, 00:06:57/00:02:50

(10.1.102.12, 226.1.1.1), 00:07:21/00:01:45, flags: FTGqx
  Incoming interface: Vlan102, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan901, Forward/Sparse, 00:07:21/stopped

(*, 224.0.1.40), 1d05h/00:02:03, RP 10.2.255.255, flags: SJPLGx
  Incoming interface: Vlan901, RPF nbr 172.16.254.3
  Outgoing interface list: Null
Leaf-02#

```

次に、VTEP 2 での `show ip mfib vrf vrf-name` コマンドの出力例を示します。

```

Leaf-02# show ip mfib vrf green
Entry Flags:   C - Directly Connected, S - Signal, IA - Inherit A flag,
               ET - Data Rate Exceeds Threshold, K - Keepalive
               DDE - Data Driven Event, HW - Hardware Installed
               ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
               MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
               MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
               e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A IC NS
(*,226.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  3/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A NS
  Vlan102 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(10.1.102.12,226.1.1.1) Flags: HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding: 215/0/118/0, Other: 0/0/0
  Vlan102 Flags: A
  Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
    Pkts: 0/0/2   Rate: 0 pps
(10.2.255.1,226.1.1.1) Flags: HW

```

例: RP が BGP EVPN VXLAN ファブリック内にある場合の IPv4 マルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

```
SW Forwarding: 2/0/100/0, Other: 0/0/0
Leaf-02#
```

次に、VTEP 2 での **show bgp ipv4 mvpn all** コマンドの出力例を示します。

```
Leaf-02# show bgp ipv4 mvpn all
BGP table version is 94, local router ID is 172.16.255.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
* i   [5][1:1][10.1.102.12][226.1.1.1]/18
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
*>i   [5][1:1][10.2.255.1][226.1.1.1]/18
      172.16.255.6          0      100      0 ?
* i   172.16.255.6          0      100      0 ?
* i   [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
*>   [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
      0.0.0.0                32768 ?
Route Distinguisher: 172.16.254.4:102
*>   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
      0.0.0.0                32768 ?
Leaf-02#
```

次に、VTEP 2 での **show ip mroute** コマンドの出力例を示します。

```
Leaf-02# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encaps-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:59
```

```
(172.16.254.6, 239.1.1.1), 00:06:55/00:01:59, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:06:55/00:02:04

(172.16.254.4, 239.1.1.1), 04:23:16/00:03:29, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 04:23:16/00:02:57

(*, 224.0.1.40), 1d05h/00:02:02, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:02
Leaf-02#
```

次に、VTEP 2 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-02# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
                  e - Encap helper tunnel flag.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  2/0/170/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 1/0/150/0, Other: 0/0/0
  HW Forwarding: 12469/0/177/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  1/0/224/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
```

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4 マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

Pkts: 0/0/0    Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
SW Forwarding: 2/0/163/0, Other: 3/1/2
HW Forwarding: 9233/0/164/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/1    Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 1/0/206/0, Other: 0/0/0
HW Forwarding: 3767/0/163/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1    Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 8/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0    Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 22/18/4
HW Forwarding: 7870/0/156/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/1    Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 2/0/150/0, Other: 0/0/0
HW Forwarding: 412/1/168/1, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/2    Rate: 0 pps
Leaf-02#

```

RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4 マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (74 ページ) に戻ります。

ボーダーVTEPの設定を確認する出力

次に、ボーダーVTEPでの **show nve peers** コマンドの出力例を示します。

```

Border# show nve peers
Interface VNI      Type Peer-IP          RMAC/Num_RTs  eVNI      state flags UP time
nve1     50901    L3CP 172.16.254.3      10b3.d56a.8fc8 50901     UP  A/-/4 1d05h
nve1     50901    L3CP 172.16.254.4      7c21.0dbd.9548 50901     UP  A/-/4 1d05h
nve1     50901    L3CP 172.16.254.3      10b3.d56a.8fc8 50901     UP  A/M/6 1d05h
nve1     50901    L3CP 172.16.254.4      7c21.0dbd.9548 50901     UP  A/M/6 1d05h
nve1     10101    L2CP 172.16.254.3       6            10101     UP  N/A   1d05h
nve1     10102    L2CP 172.16.254.4       7            10102     UP  N/A   1d05h
Border#

```

次に、ボーダーVTEPでの **show l2vpn evpn peers vxlan** コマンドの出力例を示します。

```

Border# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP          Num routes eVNI      UP time
-----
nve1     10101    172.16.254.3    6          10101    1d05h
nve1     10102    172.16.254.4    7          10102    1d05h
Border#

```

次に、ボーダーVTEPでの **show bgp ipv4 mvpn all summary** コマンドの出力例を示します。

```
Border# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 102, main routing table version 102
6 network entries using 1824 bytes of memory
8 path entries using 1088 bytes of memory
5/5 BGP path/bestpath attribute entries using 1560 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
20 BGP extended community entries using 2706 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7362 total bytes of memory
BGP activity 133/39 prefixes, 265/144 paths, scan interval 60 secs
8 networks peaked at 12:14:22 Aug 6 2020 UTC (1d05h ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   2114   1995    102   0    0 1d05h    2
172.16.255.2  4      65001   2112   1990    102   0    0 1d05h    2
Border#
```

次に、ボーダーVTEPでの **show ip pim vrf vrf-namerp mapping** コマンドの出力例を示します。

```
Border# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 10.2.255.255 (?)
Border#
```

次に、ボーダーVTEPでの **show ip routing vrf vrf-name** コマンドの出力例を示します。

```
Border# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "bgp 65001", distance 200, metric 0, type internal
  Redistributing via ospf 2
  Advertised by ospf 2 subnets
  Last update from 172.16.254.3 on Vlan901, 04:02:51 ago
  Routing Descriptor Blocks:
    * 172.16.254.3 (default), from 172.16.255.1, 04:02:51 ago, via Vlan901
      opaque_ptr 0x7FEF6836D190
      Route metric is 0, traffic share count is 1
      AS Hops 0
      MPLS label: none
Border#
```

次に、ボーダーVTEPでの **show ip igmp vrf vrf-namegroups** コマンドの出力例を示します。

```
Border# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address      Interface      Uptime      Expires      Last Reporter      Group
Accounted
```

例：RP が BGP EVPN VXLAN ファブリック内にある場合の IPv4 マルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

```
224.0.1.40      Vlan901          1d05h      00:01:58  172.16.254.6
Border#
```

次に、ボーダー VTEP での **show ip mroute vrf vrf-name** コマンドの出力例を示します。

```
Border# show ip mroute vrf green
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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 1d05h/00:03:07, RP 10.2.255.255, flags: SJgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.3
  Outgoing interface list:
    Vlan2001, Forward/Sparse, 04:02:51/00:03:07

(10.2.255.1, 226.1.1.1), 00:09:51/00:01:02, flags: TGqx
  Incoming interface: Vlan2001, RPF nbr 10.2.1.2
  Outgoing interface list:
    Vlan901, Forward/Sparse, 00:09:49/stopped

(10.1.102.12, 226.1.1.1), 00:10:12/00:03:09, flags: TgQx
  Incoming interface: Vlan901, RPF nbr 172.16.254.4
  Outgoing interface list:
    Vlan2001, Forward/Sparse, 00:10:12/00:03:07

(*, 224.0.1.40), 1d05h/00:03:10, RP 10.2.255.255, flags: SJCLgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.3
  Outgoing interface list:
    Vlan2001, Forward/Sparse, 04:02:51/00:03:10
Border#
```

次に、ボーダー VTEP での **show ip mfib vrf vrf-name** コマンドの出力例を示します。

```
Border# show ip mfib vrf green
Entry Flags:  C - Directly Connected, S - Signal, IA - Inherit A flag,
              ET - Data Rate Exceeds Threshold, K - Keepalive
              DDE - Data Driven Event, HW - Hardware Installed
              ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
              MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
              MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
              e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
```



```

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A IC NS
  Vlan2001 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(*,226.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  6/0/122/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A NS
  Vlan2001 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(10.1.102.12,226.1.1.1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 304/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan2001 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(10.2.255.1,226.1.1.1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 1/0/1
  HW Forwarding: 582/1/122/0, Other: 0/0/0
  Vlan2001 Flags: A
  Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
    Pkts: 0/0/0   Rate: 0 pps
Border#

```

次に、ボーダー VTEP での **show bgp ipv4 mvpn all** コマンドの出力例を示します。

```

Border# show bgp ipv4 mvpn allBGP table version is 102, local router ID is 172.16.255.6
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
* i   [5][1:1][10.1.102.12][226.1.1.1]/18
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
*>   [5][1:1][10.2.255.1][226.1.1.1]/18
      0.0.0.0                32768 ?
*>   [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
      0.0.0.0                32768 ?
*>   [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
      0.0.0.0                32768 ?
*>i   [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
      172.16.255.3          0      100      0 ?
* i   172.16.255.3          0      100      0 ?
Route Distinguisher: 172.16.254.4:102
*>   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
      0.0.0.0                32768 ?
Border#

```

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

次に、ボーダーVTEPでのshow ip mroute コマンドの出力例を示します。

```
Border# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:56

(172.16.254.6, 239.1.1.1), 00:09:47/00:02:24, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 00:09:47/00:02:33

(172.16.254.4, 239.1.1.1), 04:26:08/00:02:10, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:26:08/00:00:51

(*, 224.0.1.40), 1d05h/00:02:56, RP 172.16.255.255, flags: SJCL
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:56

(*, 225.0.0.102), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:56

(172.16.254.4, 225.0.0.102), 1d05h/00:01:27, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:56

(172.16.254.6, 225.0.0.102), 1d05h/00:01:53, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:43, A

(*, 225.0.0.101), 1d05h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:56

(172.16.254.3, 225.0.0.101), 1d05h/00:01:10, flags: JTx
```

```
Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
Outgoing interface list:
  Tunnel0, Forward/Sparse, 1d05h/00:02:08
Border#
```

次に、ボーダーVTEPでのshow ip mfib コマンドの出力例を示します。

```
Border# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  8/0/146/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 7/0/125/0, Other: 0/0/0
  HW Forwarding: 12570/0/177/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/7   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  1/0/172/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding:  9199/0/176/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 17/0/174/0, Other: 10/9/1
  HW Forwarding:  3789/0/151/0, Other: 0/0/0
```

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4 マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

Null0 Flags: A
TenGigabitEthernet1/0/2 Flags: F
  Pkts: 0/0/16   Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 9/0/168/0, Other: 0/0/0
TenGigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 7961/0/167/0, Other: 0/0/0
TenGigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 2/0/150/0, Other: 2/2/0
HW Forwarding: 580/1/156/1, Other: 0/0/0
Null0 Flags: A
TenGigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
Border#

```

RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4 マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (74 ページ) に戻ります。

スパインスイッチ1の設定を確認するための出力

次に、スパインスイッチ1での **show bgp ipv4 mvpn all summary** コマンドの出力例を示します。

```

Spine-01# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 204, main routing table version 204
6 network entries using 1824 bytes of memory
16 path entries using 2176 bytes of memory
4/4 BGP path/bestpath attribute entries using 1216 bytes of memory
3 BGP rinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2356 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7716 total bytes of memory
BGP activity 266/218 prefixes, 3029/2926 paths, scan interval 60 secs
8 networks peaked at 12:20:11 Aug 6 2020 UTC (1d05h ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.2  4      65001   2496   2445    204   0    0 1d08h    6
172.16.255.3  4      65001   1985   2115    204   0    0 1d05h    2
172.16.255.4  4      65001   1995   2111    204   0    0 1d05h    4
172.16.255.6  4      65001   1999   2118    204   0    0 1d05h    4
Spine-01#

```

次に、スパインスイッチ1での **show ip pim rp mapping** コマンドの出力例を示します。

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)
Spine-01#
```

次に、スパインスイッチ1での **show bgp ipv4 mvpn all** コマンドの出力例を示します。

```
Spine-01# show bgp ipv4 mvpn all
BGP table version is 204, local router ID is 172.16.255.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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
* i   [5][1:1][10.1.102.12][226.1.1.1]/18
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   [5][1:1][10.2.255.1][226.1.1.1]/18
      172.16.255.6          0      100      0 ?
*>i   172.16.255.6          0      100      0 ?
* i   [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   172.16.255.6          0      100      0 ?
* i   [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   172.16.255.6          0      100      0 ?
* i   [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
      172.16.255.4          0      100      0 ?
* i   172.16.255.3          0      100      0 ?
*>i   172.16.255.3          0      100      0 ?
Route Distinguisher: 172.16.254.4:102
* i   [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
      172.16.255.6          0      100      0 ?
* i   172.16.255.3          0      100      0 ?
*>i   172.16.255.3          0      100      0 ?
Spine-01#
```

次に、スパインスイッチ1での **show ip mroute** コマンドの出力例を示します。

```
Spine-01# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFF-SA cache created entry,
```

例: RP が BGP EVPN VXLAN ファブリック内にある場合の IPv4 マルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

```

    * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 04:29:40/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 239.1.1.1), 00:13:17/00:02:24, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 239.1.1.1), 04:27:38/00:02:41, flags: PTA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(*, 224.0.1.40), 1w0d/00:02:43, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w0d/00:02:43

(*, 225.0.0.102), 1w0d/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null
Spine-01#

```

次に、スパインスイッチ 1 での **show ip mfib** コマンドの出力例を示します。

```

Spine-01# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 83/83/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  Loopback2 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 1/0/206/0, Other: 282/0/282
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0

```

```

Tunnell Flags: A
GigabitEthernet1/0/2 Flags: NS
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/4 Flags: NS
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 4/3/1
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 7/0/158/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/4 Flags: NS
Spine-01#
    
```

RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4 マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (74 ページ) に戻ります。

スパインスイッチ2の設定を確認するための出力

次に、スパインスイッチ2での **show bgp ipv4 mvpn all summary** コマンドの出力例を示します。

```

Spine-02# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 164, main routing table version 164
6 network entries using 1824 bytes of memory
16 path entries using 2176 bytes of memory
4/4 BGP path/bestpath attribute entries using 1216 bytes of memory
3 BGP rinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2356 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7716 total bytes of memory
BGP activity 297/249 prefixes, 3131/3028 paths, scan interval 60 secs
8 networks peaked at 12:20:59 Aug 6 2020 UTC (1d05h ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   2448   2499    164   0    0  1d08h    6
172.16.255.3  4      65001   1988   2114    164   0    0  1d05h    2
172.16.255.4  4      65001   1998   2110    164   0    0  1d05h    4
172.16.255.6  4      65001   1996   2119    164   0    0  1d05h    4
Spine-02#
    
```

次に、スパインスイッチ2での **show ip pim rp mapping** コマンドの出力例を示します。

```

Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings
    
```

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)
Spine-02#
```

次に、スパインスイッチ2での **show bgp ipv4 mvpn all** コマンドの出力例を示します。

```
Spine-02# show bgp ipv4 mvpn all
BGP table version is 164, local router ID is 172.16.255.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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
 * i   [5] [1:1] [10.1.102.12] [226.1.1.1] /18
       172.16.255.4          0    100    0 ?
 *>i   172.16.255.4          0    100    0 ?
 * i   [5] [1:1] [10.2.255.1] [226.1.1.1] /18
       172.16.255.6          0    100    0 ?
 *>i   172.16.255.6          0    100    0 ?
 *>i   [6] [1:1] [65001] [10.2.255.255/32] [224.0.1.40/32] /22
       172.16.255.4          0    100    0 ?
 * i   172.16.255.4          0    100    0 ?
 * i   172.16.255.6          0    100    0 ?
 *>i   [6] [1:1] [65001] [10.2.255.255/32] [226.1.1.1/32] /22
       172.16.255.4          0    100    0 ?
 * i   172.16.255.4          0    100    0 ?
 * i   172.16.255.6          0    100    0 ?
 * i   [7] [1:1] [65001] [10.2.255.1/32] [226.1.1.1/32] /22
       172.16.255.4          0    100    0 ?
 * i   172.16.255.3          0    100    0 ?
 *>i   172.16.255.3          0    100    0 ?
Route Distinguisher: 172.16.254.4:102
 * i   [7] [172.16.254.4:102] [65001] [10.1.102.12/32] [226.1.1.1/32] /22
       172.16.255.6          0    100    0 ?
 * i   172.16.255.3          0    100    0 ?
 *>i   172.16.255.3          0    100    0 ?
Spine-02#
```

次に、スパインスイッチ2での **show ip mroute** コマンドの出力例を示します。

```
Spine-02# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
```



```

Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 3d12h/00:03:14, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:31
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:14
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:03:09

(172.16.254.6, 239.1.1.1), 00:15:48/00:01:26, flags: T
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 00:15:48/00:03:24
    GigabitEthernet1/0/2, Forward/Sparse, 00:15:48/00:03:26

(172.16.254.4, 239.1.1.1), 04:32:09/00:01:28, flags: T
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 04:32:09/00:03:09
    GigabitEthernet1/0/1, Forward/Sparse, 04:32:09/00:03:14

(*, 224.0.1.40), 1w0d/00:03:29, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:48
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:29
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:03:17
    Loopback2, Forward/Sparse, 1w0d/00:02:34

(*, 225.0.0.102), 1w0d/00:03:28, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:55
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:00
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:03:28

(172.16.254.4, 225.0.0.102), 1d05h/00:02:09, flags: MT
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:03:28
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:17

(172.16.254.6, 225.0.0.102), 1d05h/00:01:40, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:59
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:05

(*, 225.0.0.101), 3d12h/00:03:21, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:33
    GigabitEthernet1/0/1, Forward/Sparse, 1d05h/00:03:21
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:02:47

(172.16.254.3, 225.0.0.101), 1d05h/00:02:05, flags: TA
  Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:02:57
    GigabitEthernet1/0/4, Forward/Sparse, 1d05h/00:02:47
Spine-02#

```

例：RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

次に、スパインスイッチ2でのshow ip mfib コマンドの出力例を示します。

```
Spine-02# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
Loopback2 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 9/0/112/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/2   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/2   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 4/0/132/0, Other: 0/0/0
  HW Forwarding: 12607/0/177/0, Other: 0/0/0
GigabitEthernet1/0/1 Flags: A
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/4   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 27/0/101/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
```

```

SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 9232/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 3789/0/163/0, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 10/0/150/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 8144/0/167/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 942/1/168/1, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
Spine-02#

```

RPがBGP EVPN VXLAN ファブリック内にある場合のIPv4 マルチキャストトラフィックに対して PIM-SM を使用した TRM の確認 (74 ページ) に戻ります。

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

この例では、RPがBGP EVPN VXLAN ファブリックの内部にある場合にIPv4およびIPv6 のマルチキャストトラフィックに PIM-SM を使用してレイヤ 3 TRM を設定し、確認する方法を示します。この例では、[図 11：RPがBGP EVPN VXLAN ファブリック内にある場合の PIM-SM での TRM \(65 ページ\)](#) のトポロジを示します。

例：RP が BGP EVPN VXLAN ファブリックの内部にある場合の IPv4 および IPv6 のマルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

このトポロジには 2 台のスパインスイッチと、3 台のルータで外部ネットワークに接続された 3 台の VTEP を備えた EVPN VXLAN ネットワークが示されています。BGP EVPN VXLAN ファブリック内の VTEP 1 はこのトポロジで RP として機能し、ボーダー VTEP はルータ 1 を介してファブリックを外部ネットワークに接続します。このトポロジでは、IPv4 マルチキャストグループは 226.1.1.1、IPv6 マルチキャストグループは FF06:1::1 です。次の表に、このトポロジのデバイスの設定例を示します。

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 6: RPがBGP EVPN VXLAN ファブリックの内部にある場合に、IPv4 および IPv6 のマルチキャストトラフィックにPIM-SMを使用してTRMを設定するためのVTEP 1、ボーダーVTEP、およびVTEP 2の設定

VTEP 1	ボーダーVTEP	VTEP 2
<pre>Leaf-01# show running-config hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>	<pre>Border# show running-config hostname Border ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>	<pre>Leaf-02# show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre>interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 vrf forwarding green ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ipv6 address FC00:2:255::255/128 ipv6 enable ! interface Loopback901 vrf forwarding green ip address 10.1.255.1 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::1/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable</pre>	<pre>vlan 2001 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback901 vrf forwarding green ip address 10.1.255.4 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::4/128 ipv6 enable ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/2 no switchport ip address 172.16.26.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/5 switchport trunk allowed vlan 2001 switchport mode trunk ! interface TenGigabitEthernet1/0/10 switchport access vlan 102 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable !</pre>	<pre>interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback901 vrf forwarding green ip address 10.1.255.2 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::2/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable</pre>

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ポーター VTEP	VTEP 2
<pre> ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! </pre>	<pre> interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface Vlan2001 vrf forwarding green ip address 10.2.1.1 255.255.255.0 ip mtu 1500 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ipv6 address FC00:2:1::1/64 ipv6 enable ipv6 mtu 1500 ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospfv3 1 ! address-family ipv6 unicast vrf green redistribute bgp 65001 exit-address-family ! router ospf 2 vrf green redistribute bgp 65001 ! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 </pre>	<pre> ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family </pre>

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre> address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-01# </pre>	<pre> ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-02# </pre>	<pre> ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-02# </pre>
	<pre> ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static redistribute ospf 2 match internal external 1 external 2 exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute ospf 1 include-connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ! end ! Border# </pre>	

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 7: RPがBGP EVPN VXLAN ファブリックの内部にある場合にIPv4 およびIPv6 のマルチキャスト用にPIM-SMを使用してTRMを設定するためのスパインスイッチ 1およびスパインスイッチ 2の設定

スパインスイッチ 1	スパインスイッチ 2

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

スパインスイッチ1	スパインスイッチ2
<pre> Spine-01# show running-config hostname Spine-01 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.14.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.16.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.1 ! router bgp 65001 bgp router-id 172.16.255.1 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! </pre>	<pre> Spine-02# show running-config hostname Spine-02 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.26.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.2 ! router bgp 65001 bgp router-id 172.16.255.2 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! </pre>

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

スパインスイッチ1	スパインスイッチ2
<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-01# </pre>	<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-02# </pre>

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4 およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 8: RPがBGP EVPN VXLAN ファブリックの外部にある場合に、IPv4 および IPv6のマルチキャストトラフィックにPIM-SMを使用してTRMを設定するためのルータ 1、ルータ 2、およびルータ 3の設定

ルータ 1	ルータ 2	ルータ 3
<pre> R1# show running-config hostname R1 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::1/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:12::1/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:13::1/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface GigabitEthernet0/0/1.2001 encapsulation dot1Q 2001 ip address 10.2.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ipv6 address FC00:2:1::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! </pre>	<pre> R2# show running-config hostname R2 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.2 255.255.255.255 ip pim sparse-mode ip igmp join-group 226.1.1.1 ip ospf 1 area 0 ipv6 address FC00:2:255::2/128 ipv6 enable ipv6 mld join-group FF06:1::1 ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:12::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:23::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.2 ! ip pim rp-address 10.2.255.255 </pre>	<pre> R3# show running-config hostname R3 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::3/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:13::3/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:23::3/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.3 ! ip pim rp-address 10.2.255.255 ! </pre>

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

ルータ 1	ルータ 2	ルータ 3
<pre>router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.1 ! ip pim rp-address 10.2.255.255 ! ipv6 pim rp-address FC00:2:255::255 ! end ! R1#</pre>	<pre>! ipv6 pim rp-address FC00:2:255::255 ! end ! R2#</pre>	<pre>ipv6 pim rp-address FC00:2:255::255 ! end ! R3#</pre>

RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認

次の項では、上記で設定したトポロジーのデバイスでPIM-SMを使用してTRMを確認するshowコマンドの出力例を示します。

- [VTEP 1 \(BGP EVPN VXLAN ファブリック内に RP\) の設定を確認するための出力 \(109 ページ\)](#)
- [VTEP 2 の設定を確認する出力 \(117 ページ\)](#)
- [ボーダー VTEP の設定を確認する出力 \(124 ページ\)](#)
- [スパインスイッチ 1 の設定を確認するための出力 \(132 ページ\)](#)
- [スパインスイッチ 2 の設定を確認するための出力 \(135 ページ\)](#)

VTEP 1 (BGP EVPN VXLAN ファブリック内に RP) の設定を確認するための出力

次に、VTEP 1 での show nve peers コマンドの出力例を示します。

```
Leaf-01# show nve peers
Interface VNI Type Peer-IP RMAC/Num_RTs eVNI state flags UP time
nve1 50901 L3CP 172.16.254.6 0c75.bd67.ef48 50901 UP A/-/4 1d05h
nve1 50901 L3CP 172.16.254.4 7c21.0dbd.9548 50901 UP A/-/4 1d05h
nve1 50901 L3CP 172.16.254.6 0c75.bd67.ef48 50901 UP A/M/6 1d05h
nve1 50901 L3CP 172.16.254.4 7c21.0dbd.9548 50901 UP A/M/6 1d05h
nve1 10102 L2CP 172.16.254.4 7 10102 UP N/A 1d05h
nve1 10102 L2CP 172.16.254.6 5 10102 UP N/A 1d05h
Leaf-01#
```

次に、VTEP 1 での show l2vpn evpn peers vxlan コマンドの出力例を示します。

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI Peer-IP Num routes eVNI UP time
-----
nve1 10102 172.16.254.4 7 10102 1d05h
```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
nve1      10102      172.16.254.6          5          10102      1d05h
Leaf-01#
```

次に、VTEP 1 での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Leaf-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 60, main routing table version 60
5 network entries using 1960 bytes of memory
8 path entries using 1280 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
18 BGP extended community entries using 2396 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7068 total bytes of memory
BGP activity 139/41 prefixes, 275/138 paths, scan interval 60 secs
5 networks peaked at 15:46:09 Aug 6 2020 UTC (1d02h ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   2135   2003     60    0    0 1d05h    3
172.16.255.2  4      65001   2131   2003     60    0    0 1d05h    3
Leaf-01#
```

次に、VTEP 1 での **show ipv6 pim vrfvrf-name group-map** コマンドの出力例を示します。

```
Leaf-01# show ipv6 pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF06:1::/8*
  SM, RP: FC00:2:255::255
  RPF: Tu7,FC00:2:255::255 (us)
  Info source: Static
  Uptime: 1d02h, Groups: 1
Leaf-01#
```

次に、VTEP 1 での **show ipv6 routing vrf** コマンドの出力例を示します。

```
Leaf-01# show ipv6 routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "connected", distance 0, metric 0, type receive, connected
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    receive via Loopback255
    Last updated 04:21:51 ago
Leaf-01#
```

次に、VTEP 1 での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

```
Leaf-01# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                               Interface
      Uptime      Expires
FF06:1::1                                     Vlan101
```

```
1d02h 00:02:28
Leaf-01#
```

次に、VTEP 1 での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-01# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d02h/00:03:13, RP FC00:2:255::255, flags: SCJG
  Incoming interface: Tunnel17
  RPF nbr: FC00:2:255::255
  Immediate Outgoing interface list:
    Vlan101, Forward, 1d02h/00:03:13
    Vlan901, Forward, 04:21:51/never

(FC00:1:102::12, FF06:1::1), 00:02:17/00:03:04, flags: SJTg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.4
  Immediate Outgoing interface list:
    Vlan101, Forward, 00:02:13/00:03:23

(FC00:2:255::1, FF06:1::1), 00:01:24/00:03:04, flags: SJTg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Immediate Outgoing interface list:
    Vlan101, Forward, 00:01:20/00:03:13
Leaf-01#
```

次に、VTEP 1 での **show ipv6 mfib vrf vrf-name** コマンドの出力例を示します。

```
Leaf-01# show ipv6 mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count  Egress Rate in pps
VRF green
(*,FF00::/8) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 412/412/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

Tunnel7 Flags: NS
(*,FF00::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF02::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF06:1::1) Flags: C HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding: 4/0/126/0, Other: 0/0/0
  Tunnel7 Flags: A NS
  Vlan101 Flags: F NS
    Pkts: 0/0/2    Rate: 0 pps
  Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
    Pkts: 0/0/2    Rate: 0 pps
(FC00:1:102::12,FF06:1::1) Flags: HW
  SW Forwarding: 1/0/100/0, Other: 0/0/0
  HW Forwarding: 64/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan101 Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
(FC00:2:255::1,FF06:1::1) Flags: HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding: 38/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan101 Flags: F NS
    Pkts: 0/0/2    Rate: 0 pps
(*,FF10::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF12::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0

```



```

HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF72::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF80::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF82::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0

```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
(* ,FFD2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FFE0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FFE2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FFF0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FFF2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
Leaf-01#
```

次に、VTEP 1 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```
Leaf-01# show bgp ipv6 mvpn all
BGP table version is 60, local router ID is 172.16.255.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
* i   [5] [1:1] [FC00:1:102::12] [FF06:1::1] /42
      172.16.255.4          0    100    0 ?
*>i   172.16.255.4          0    100    0 ?
* i   [5] [1:1] [FC00:2:255::1] [FF06:1::1] /42
      172.16.255.6          0    100    0 ?
*>i   172.16.255.6          0    100    0 ?
* i   [6] [1:1] [65001] [FC00:2:255::255] [FF06:1::1] /46
      172.16.255.4          0    100    0 ?
*>i   172.16.255.4          0    100    0 ?
*>    [7] [1:1] [65001] [FC00:2:255::1] [FF06:1::1] /46
      ::                      32768 ?
Route Distinguisher: 172.16.254.4:102
*>    [7] [172.16.254.4:102] [65001] [FC00:1:102::12] [FF06:1::1] /46
      ::                      32768 ?
Leaf-01#
```

次に、VTEP 1 での **show ip mroute** コマンドの出力例を示します。

```
Leaf-01# show 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,
        Y - Joined MDT-data group, y - Sending to MDT-data group,
        G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
        N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
        Q - Received BGP S-A Route, q - Sent BGP S-A Route,
        V - RD & Vector, v - Vector, p - PIM Joins on route,
        x - VxLAN group, c - PFP-SA cache created entry,
        * - determined by Assert, # - iif-starg configured on rpf intf,
        e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
```

```

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:34

(172.16.254.3, 239.1.1.1), 00:02:17/00:02:05, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0, Registering
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:02:17/00:03:09, A

(172.16.254.6, 239.1.1.1), 00:28:47/00:02:22, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:28:47/00:01:12

(172.16.254.4, 239.1.1.1), 04:45:08/00:01:03, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:45:08/00:02:51

(*, 224.0.1.40), 1d05h/00:02:38, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d05h/00:02:38

(*, 225.0.0.102), 1d05h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:34

(172.16.254.4, 225.0.0.102), 1d05h/00:02:33, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:00:56

(172.16.254.6, 225.0.0.102), 1d05h/00:01:12, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:34

(*, 225.0.0.101), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:01:34

(172.16.254.3, 225.0.0.101), 1d05h/00:03:17, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:03:17
Leaf-01#

```

次に、VTEP 1 での **show ip mfib** コマンドの出力例を示します。

```

Leaf-01# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,

```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Loopback0 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1/0/114/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 13/0/127/0, Other: 2/2/0
  HW Forwarding: 12686/0/165/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 2/0/172/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding: 9299/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding: 3817/0/163/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 4/4/0
  HW Forwarding: 15/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,239.1.1.1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 6/5/1
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Null0 Flags: A NS
GigabitEthernet1/0/2 Flags: F

```

```

Pkts: 0/0/0    Rate: 0 pps
Tunnel4 Flags: F
Pkts: 0/0/0    Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 8525/0/167/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1    Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 2/0/150/0, Other: 0/0/0
HW Forwarding: 1629/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/2    Rate: 0 pps
Leaf-01#

```

RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (109 ページ) に戻ります。

VTEP 2 の設定を確認する出力

次に、VTEP 2 での `show nve peers` コマンドの出力例を示します。

```

Leaf-02# show nve peers
Interface VNI      Type Peer-IP          RMAC/Num_RTs  eVNI      state flags UP time
nve1      50901    L3CP 172.16.254.6    0c75.bd67.ef48 50901     UP  A/-/4 1d05h
nve1      50901    L3CP 172.16.254.3    10b3.d56a.8fc8 50901     UP  A/-/4 1d05h
nve1      50901    L3CP 172.16.254.6    0c75.bd67.ef48 50901     UP  A/M/6 1d05h
nve1      50901    L3CP 172.16.254.3    10b3.d56a.8fc8 50901     UP  A/M/6 1d05h
nve1      10101    L2CP 172.16.254.3      6              10101     UP  N/A   1d05h
nve1      10102    L2CP 172.16.254.6      5              10102     UP  N/A   1d05h
Leaf-02#

```

次に、VTEP 2 での `show l2vpn evpn peers vxlan` コマンドの出力例を示します。

```

Leaf-02# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP          Num routes eVNI      UP time
-----
nve1      10101    172.16.254.3    6          10101     1d05h
nve1      10102    172.16.254.6    5          10102     1d05h
Leaf-02#

```

次に、VTEP 2 での `show bgp ipv6 mvpn all summary` コマンドの出力例を示します。

```

Leaf-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 85, main routing table version 85
6 network entries using 2352 bytes of memory
8 path entries using 1280 bytes of memory
5/5 BGP path/bestpath attribute entries using 1560 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
18 BGP extended community entries using 2396 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7772 total bytes of memory
BGP activity 145/47 prefixes, 249/117 paths, scan interval 60 secs

```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
6 networks peaked at 15:50:41 Aug 6 2020 UTC (1d02h ago)

Neighbor      V          AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4          65001   2143   2019      85    0    0 1d05h    2
172.16.255.2  4          65001   2139   2019      85    0    0 1d05h    2
Leaf-02#
```

次に、VTEP 2 での **show ip pim vrfvrf-name group-map** コマンドの出力例を示します。

```
Leaf-02# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
  SM, RP: FC00:2:255::255
  RPF: V1901,::FFFF:172.16.254.3
  Info source: Static
  Uptime: 1d05h, Groups: 1
Leaf-02#
```

次に、VTEP 2 での **show ip routing vrf** コマンドの出力例を示します。

```
Leaf-02# show ip routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "bgp 65001", distance 200, metric 0, type internal
  Route count is 1/1, share count 0
  Routing paths:
    172.16.254.3%default, Vlan901%default
    From AC10:FF01::
    opaque_ptr 0x7F65BA333EC0
    Last updated 04:26:58 ago
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                               Interface
      Uptime    Expires
FF06:1::1                                     Vlan102
      1d05h      00:03:53
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State
```

```
(* , FF06:1::1), 1d05h/never, RP FC00:2:255::255, flags: SCJg
Incoming interface: Vlan901
RPF nbr: ::FFFF:172.16.254.3
Immediate Outgoing interface list:
  Vlan102, Forward, 1d05h/never

(FC00:1:102::12, FF06:1::1), 00:07:24/00:03:28, flags: SFJTGq
Incoming interface: Vlan102
RPF nbr: FE80::46D3:CAFF:FE28:6CC5
Immediate Outgoing interface list:
  Vlan901, Forward, 00:07:24/never

(FC00:2:255::1, FF06:1::1), 00:06:31/00:00:32, flags: SJTGq
Incoming interface: Vlan901
RPF nbr: ::FFFF:172.16.254.6
Inherited Outgoing interface list:
  Vlan102, Forward, 1d05h/never
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mfib vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,FF00::/8) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF00::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF02::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 10/10/0
(*,FF06:1::1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  3/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A NS
  Vlan102 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(FC00:1:102::12,FF06:1::1) Flags: HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding:  217/0/118/0, Other: 0/0/0
  Vlan102 Flags: A F
    Pkts: 0/0/0   Rate: 0 pps
  Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
    Pkts: 0/0/1   Rate: 0 pps
(FC00:2:255::1,FF06:1::1) Flags: HW
  SW Forwarding: 2/0/100/0, Other: 0/0/0
  HW Forwarding:  191/0/126/0, Other: 0/0/0
```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Vlan901, VXLAN Decap Flags: A
Vlan102 Flags: F NS
  Pkts: 0/0/2   Rate: 0 pps
(*,FF10::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF12::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
```



```

HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF72::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF80::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF82::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFE0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFE2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
Leaf-02#

```

次に、VTEP 2 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```

Leaf-02# show bgp ipv6 mvpn all
BGP table version is 85, local router ID is 172.16.255.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,

```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

        t secondary path, L long-lived-stale,
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 green)
 *> [5] [1:1] [FC00:1:102::12] [FF06:1::1]/42
      ::
      32768 ?
 * i [5] [1:1] [FC00:2:255::1] [FF06:1::1]/42
      172.16.255.6          0    100    0 ?
 *>i          172.16.255.6          0    100    0 ?
 *> [6] [1:1] [65001] [FC00:2:255::255] [FF06:1::1]/46
      ::
      32768 ?
 *>i [7] [1:1] [65001] [FC00:1:102::12] [FF06:1::1]/46
      172.16.255.3          0    100    0 ?
 *> [7] [1:1] [65001] [FC00:2:255::1] [FF06:1::1]/46
      ::
      32768 ?
Route Distinguisher: 172.16.254.4:102
 * i [7] [172.16.254.4:102] [65001] [FC00:1:102::12] [FF06:1::1]/46
      172.16.255.3          0    100    0 ?
 *>i          172.16.255.3          0    100    0 ?
Leaf-02#

```

次に、VTEP 2 での **show ip mroute** コマンドの出力例を示します。

```

Leaf-02# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 1d05h/stopped, RP 172.16.255.255, flags: SJCFx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Tunnel0, Forward/Sparse, 1d05h/00:02:00

(172.16.254.6, 239.1.1.1), 00:33:54/00:01:36, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Tunnel0, Forward/Sparse, 00:33:54/00:02:05

(172.16.254.4, 239.1.1.1), 04:50:15/00:03:03, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 04:50:15/00:03:29

(*, 224.0.1.40), 1d05h/00:02:01, RP 172.16.255.255, flags: SJCL
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2

```

```

Outgoing interface list:
  Loopback0, Forward/Sparse, 1d05h/00:02:01

(*, 225.0.0.102), 1d05h/stopped, RP 172.16.255.255, flags: SJCfX
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00

(172.16.254.6, 225.0.0.102), 1d05h/00:02:05, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00

(172.16.254.4, 225.0.0.102), 1d05h/00:02:29, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d05h/00:03:28

(*, 225.0.0.101), 1d05h/stopped, RP 172.16.255.255, flags: SJCfX
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00

(172.16.254.3, 225.0.0.101), 1d05h/00:01:04, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d05h/00:02:00
Leaf-02#

```

次に、VTEP 2 での **show ip mfib** コマンドの出力例を示します。

```

Leaf-02# show ip mfib
Entry Flags:   C - Directly Connected, S - Signal, IA - Inherit A flag,
               ET - Data Rate Exceeds Threshold, K - Keepalive
               DDE - Data Driven Event, HW - Hardware Installed
               ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
               MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
               MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
               e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 2/0/170/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS

```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4 およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 12630/0/177/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 1/0/224/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
SW Forwarding: 2/0/163/0, Other: 3/1/2
HW Forwarding: 9373/0/164/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 1/0/206/0, Other: 0/0/0
HW Forwarding: 3825/0/163/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 9/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 24/20/4
HW Forwarding: 8667/0/156/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 2/0/150/0, Other: 0/0/0
HW Forwarding: 1781/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/2   Rate: 0 pps
Leaf-02#
```

RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4 およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（109ページ）に戻ります。

ボーダーVTEPの設定を確認する出力

次に、ボーダーVTEPでのshow nve peers コマンドの出力例を示します。

```
Border# show nve peers
Interface VNI      Type Peer-IP          RMAC/Num_RTs  eVNI      state flags UP time
nve1     50901    L3CP 172.16.254.3      10b3.d56a.8fc8 50901      UP  A/-/4 1d06h
nve1     50901    L3CP 172.16.254.4      7c21.0dbd.9548 50901      UP  A/-/4 1d06h
nve1     50901    L3CP 172.16.254.3      10b3.d56a.8fc8 50901      UP  A/M/6 1d06h
nve1     50901    L3CP 172.16.254.4      7c21.0dbd.9548 50901      UP  A/M/6 1d06h
```

```
nve1      10101    L2CP 172.16.254.3    6          10101    UP    N/A    1d06h
nve1      10102    L2CP 172.16.254.4    7          10102    UP    N/A    1d05h
Border#
```

次に、ボーダー VTEP での **show l2vpn evpn peers vxlan** コマンドの出力例を示します。

```
Border# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP          Num routes eVNI      UP time
-----
nve1      10101    172.16.254.3    6          10101    1d06h
nve1      10102    172.16.254.4    7          10102    1d05h
Border#
```

次に、ボーダー VTEP での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Border# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 85, main routing table version 85
5 network entries using 1960 bytes of memory
7 path entries using 1120 bytes of memory
5/5 BGP path/bestpath attribute entries using 1560 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
20 BGP extended community entries using 2706 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7530 total bytes of memory
BGP activity 137/41 prefixes, 272/148 paths, scan interval 60 secs
5 networks peaked at 15:42:39 Aug 6 2020 UTC (1d02h ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   2158   2031     85    0    0  1d06h      2
172.16.255.2  4      65001   2157   2025     85    0    0  1d06h      2
Border#
```

次に、ボーダー VTEP での **show ip pim vrf vrf-namegroup-map** コマンドの出力例を示します。

```
Border# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
  SM, RP: FC00:2:255::255
  RPF: V1901,::FFFF:172.16.254.3
  Info source: Static
  Uptime: 1d06h, Groups: 1
Border#
```

次に、ボーダー VTEP での **show ip routing vrf vrf-name** コマンドの出力例を示します。

```
Border# show ip routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "bgp 65001", distance 200, metric 0, type internal
  Redistributing via ospf 1
  Route count is 1/1, share count 0
  Routing paths:
    172.16.254.3%default, Vlan901%default
```

例：RP が BGP EVPN VXLAN ファブリックの内部にある場合の IPv4 および IPv6 のマルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

```

From AC10:FF01::
opaque_ptr 0x7FEF699AEC28
Last updated 04:34:38 ago
Border#

```

次に、ボーダー VTEP での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

```

Border# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                               Interface
  Uptime    Expires
FF06:1::1                                     Vlan102
  1d05h     00:02:29
Border#

```

次に、ボーダー VTEP での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```

Border# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d05h/00:02:52, RP FC00:2:255::255, flags: SCg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Immediate Outgoing interface list:
    Vlan102, Null, 1d05h/never
    Vlan2001, Forward, 04:34:39/00:02:52

(FC00:1:102::12, FF06:1::1), 00:15:05/00:02:32, flags: STGQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.4
  Immediate Outgoing interface list:
    Vlan2001, Forward, 00:15:03/00:02:32
  Inherited Outgoing interface list:
    Vlan102, Null, 1d05h/never

(FC00:2:255::1, FF06:1::1), 00:14:13/00:02:52, RP FC00:2:255::255, flags: SPR
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.3
  Immediate Outgoing interface list:
    Vlan2001, Null, 00:14:13/00:02:52
  Inherited Outgoing interface list:
    Vlan102, Null, 1d05h/never

(FC00:2:255::1, FF06:1::1), 00:14:12/never, flags: STGq
  Incoming interface: Vlan2001
  RPF nbr: FE80::A2B4:39FF:FE21:9183
  Immediate Outgoing interface list:
    Vlan901, Forward, 00:14:12/never

```

```
Inherited Outgoing interface list:
  Vlan102, Null, 1d05h/never
Border#
```

次に、ボーダーVTEPでの **show ipv6 mfib vrf vrf-name** コマンドの出力例を示します。

```
Border# show ipv6 mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,FF00::/8) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF00::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF02::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 12/12/0
(*,FF06:1::1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 4/4/0
  HW Forwarding: 7/0/122/0, Other: 0/0/0
Vlan901, VXLAN Decap Flags: A
Vlan2001 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(FC00:1:102::12,FF06:1::1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 450/0/125/0, Other: 0/0/0
Vlan901, VXLAN Decap Flags: A
Vlan2001 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(FC00:2:255::1,FF06:1::1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 2/1/1
  HW Forwarding: 423/0/122/0, Other: 0/0/0
Vlan2001 Flags: A
Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
  Pkts: 0/0/0   Rate: 0 pps
(*,FF10::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF12::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
(* ,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF42::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF50::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF52::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF60::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF62::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF70::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF72::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,FF80::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
```



```
(*,FF82::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFE0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFE2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
Border#
```

次に、ボーダー VTEP での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```
Border# show bgp ipv6 mvpn all
BGP table version is 85, local router ID is 172.16.255.6
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
* i   [5] [1:1] [FC00:1:102::12] [FF06:1::1] /42
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
*>   [5] [1:1] [FC00:2:255::1] [FF06:1::1] /42
      ::                    32768 ?
*>   [6] [1:1] [65001] [FC00:2:255::255] [FF06:1::1] /46
      ::                    32768 ?
* i   [7] [1:1] [65001] [FC00:2:255::1] [FF06:1::1] /46
      172.16.255.3          0      100      0 ?
*>i   172.16.255.3          0      100      0 ?
```

例：RP が BGP EVPN VXLAN ファブリックの内部にある場合の IPv4 および IPv6 のマルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

```
Route Distinguisher: 172.16.254.4:102
 *> [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
      ::                               32768 ?
Border#
```

次に、ボーダー VTEP での **show ip mroute** コマンドの出力例を示します。

```
Border# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encaps-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 1d06h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d06h/00:00:08

(172.16.254.6, 239.1.1.1), 00:41:35/00:02:45, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 00:41:35/00:03:11

(172.16.254.4, 239.1.1.1), 04:57:56/00:02:37, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 04:57:56/00:02:03

(*, 224.0.1.40), 1d06h/00:02:10, RP 172.16.255.255, flags: SJCL
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d06h/00:02:10

(*, 225.0.0.102), 1d06h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d06h/00:00:08

(172.16.254.4, 225.0.0.102), 1d06h/00:01:56, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d06h/00:00:08

(172.16.254.6, 225.0.0.102), 1d06h/00:02:16, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:21, A

(*, 225.0.0.101), 1d06h/stopped, RP 172.16.255.255, flags: SJCx
```

```
Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
Outgoing interface list:
  Tunnel0, Forward/Sparse, 1d06h/00:00:08

(172.16.254.3, 225.0.0.101), 1d06h/00:02:00, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d06h/00:00:20
Border#
```

次に、ボーダー VTEP での **show ip mfib** コマンドの出力例を示します。

```
Border# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 8/0/146/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 7/0/125/0, Other: 0/0/0
  HW Forwarding: 12768/0/177/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/7   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1/0/172/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding: 9363/0/176/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

Pkts: 0/0/1    Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 17/0/174/0, Other: 10/9/1
HW Forwarding: 3858/0/151/0, Other: 0/0/0
Null0 Flags: A
TenGigabitEthernet1/0/2 Flags: F
Pkts: 0/0/16   Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 10/0/168/0, Other: 0/0/0
TenGigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0    Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 8909/0/167/0, Other: 0/0/0
TenGigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1    Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 2/0/150/0, Other: 2/2/0
HW Forwarding: 2018/0/156/0, Other: 0/0/0
Null0 Flags: A
TenGigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0    Rate: 0 pps
Border#

```

RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (109 ページ) に戻ります。

スパインスイッチ1の設定を確認するための出力

次に、スパインスイッチ1での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```

Spine-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 78, main routing table version 78
5 network entries using 1960 bytes of memory
13 path entries using 2080 bytes of memory
4/4 BGP path/bestpath attribute entries using 1216 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2356 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7756 total bytes of memory
BGP activity 270/220 prefixes, 3041/2934 paths, scan interval 60 secs
5 networks peaked at 15:48:28 Aug 6 2020 UTC (1d02h ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.2  4      65001   2540   2489    78    0    0 1d09h    5
172.16.255.3  4      65001   2020   2157    78    0    0 1d06h    2
172.16.255.4  4      65001   2030   2154    78    0    0 1d06h    3
172.16.255.6  4      65001   2033   2160    78    0    0 1d06h    3
Spine-01#

```

次に、スパインスイッチ1での **show ip pim rp mapping** コマンドの出力例を示します。

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)
Spine-01#
```

次に、スパインスイッチ1での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```
Spine-01# show bgp ipv6 mvpn all
BGP table version is 78, local router ID is 172.16.255.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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
* i   [5][1:1][FC00:1:102::12][FF06:1::1]/42
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   [5][1:1][FC00:2:255::1][FF06:1::1]/42
      172.16.255.6          0      100      0 ?
*>i   172.16.255.6          0      100      0 ?
* i   [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
      172.16.255.6          0      100      0 ?
* i   172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
      172.16.255.4          0      100      0 ?
* i   172.16.255.3          0      100      0 ?
*>i   172.16.255.3          0      100      0 ?
Route Distinguisher: 172.16.254.4:102
* i   [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
      172.16.255.6          0      100      0 ?
* i   172.16.255.3          0      100      0 ?
*>i   172.16.255.3          0      100      0 ?
Spine-01#
```

次に、スパインスイッチ1での **show ip mroute** コマンドの出力例を示します。

```
Spine-01# show 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,
        Y - Joined MDT-data group, y - Sending to MDT-data group,
        G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
        N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
        Q - Received BGP S-A Route, q - Sent BGP S-A Route,
        V - RD & Vector, v - Vector, p - PIM Joins on route,
        x - VxLAN group, c - PFP-SA cache created entry,
        * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4 およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 04:59:49/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 239.1.1.1), 00:43:26/00:02:24, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 239.1.1.1), 04:57:47/00:01:01, flags: PTA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(*, 224.0.1.40), 1w0d/00:02:32, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w0d/00:02:32

(*, 225.0.0.102), 1w0d/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 225.0.0.102), 02:11:00/00:01:54, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 225.0.0.102), 1d06h/00:02:27, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null
Spine-01#
```

次に、スパインスイッチ1での **show ip mfib** コマンドの出力例を示します。

```
Spine-01# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 83/83/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Tunnel1 Flags: A
  Loopback2 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
```

```

SW Forwarding: 1/0/206/0, Other: 282/0/282
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
(172.16.254.4,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/2 Flags: NS
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/4 Flags: NS
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 6/5/1
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 8/0/157/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/4 Flags: NS
Spine-01#

```

RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（109ページ）に戻ります。

スパインスイッチ2の設定を確認するための出力

次に、スパインスイッチ2での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```

Spine-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 77, main routing table version 77
5 network entries using 1960 bytes of memory
13 path entries using 2080 bytes of memory
4/4 BGP path/bestpath attribute entries using 1216 bytes of memory
3 BGP rinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2356 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7756 total bytes of memory
BGP activity 301/251 prefixes, 3143/3036 paths, scan interval 60 secs
5 networks peaked at 15:49:16 Aug 6 2020 UTC (1d02h ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   2491   2541    77    0    0 1d09h    5
172.16.255.3  4      65001   2021   2155    77    0    0 1d06h    2
172.16.255.4  4      65001   2031   2152    77    0    0 1d06h    3
172.16.255.6  4      65001   2029   2161    77    0    0 1d06h    3
Spine-02#

```

例：RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

次に、スパインスイッチ2でのshow ip pim rp mapping コマンドの出力例を示します。

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)
Spine-02#
```

次に、スパインスイッチ2でのshow bgp ipv6 mvpn all コマンドの出力例を示します。

```
Spine-02# show bgp ipv6 mvpn all
BGP table version is 77, local router ID is 172.16.255.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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
* i   [5] [1:1] [FC00:1:102::12] [FF06:1::1]/42
      172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   [5] [1:1] [FC00:2:255::1] [FF06:1::1]/42
      172.16.255.6          0      100      0 ?
*>i   172.16.255.6          0      100      0 ?
* i   [6] [1:1] [65001] [FC00:2:255::255] [FF06:1::1]/46
      172.16.255.6          0      100      0 ?
* i   172.16.255.4          0      100      0 ?
*>i   172.16.255.4          0      100      0 ?
* i   [7] [1:1] [65001] [FC00:2:255::1] [FF06:1::1]/46
      172.16.255.4          0      100      0 ?
* i   172.16.255.3          0      100      0 ?
*>i   172.16.255.3          0      100      0 ?
Route Distinguisher: 172.16.254.4:102
* i   [7] [172.16.254.4:102] [65001] [FC00:1:102::12] [FF06:1::1]/46
      172.16.255.6          0      100      0 ?
* i   172.16.255.3          0      100      0 ?
*>i   172.16.255.3          0      100      0 ?
Spine-02#
```

次に、スパインスイッチ2でのshow ip mroute コマンドの出力例を示します。

```
Spine-02# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
```



```

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 3d13h/00:03:01, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:01
  GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:02:41
  GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:02:43

(172.16.254.6, 239.1.1.1), 00:44:52/00:02:29, flags: T
Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
Outgoing interface list:
  GigabitEthernet1/0/1, Forward/Sparse, 00:44:52/00:02:58
  GigabitEthernet1/0/2, Forward/Sparse, 00:44:52/00:03:02

(172.16.254.4, 239.1.1.1), 05:01:13/00:02:28, flags: T
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 05:01:13/00:03:22
  GigabitEthernet1/0/1, Forward/Sparse, 05:01:13/00:02:56

(*, 224.0.1.40), 1w0d/00:03:12, RP 172.16.255.255, flags: SJCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:12
  GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:02:54
  GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:02:44
  Loopback2, Forward/Sparse, 1w0d/00:02:32

(*, 225.0.0.102), 1w0d/00:03:26, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:21
  GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:03:26
  GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:02:56

(172.16.254.4, 225.0.0.102), 1d06h/00:02:18, flags: MT
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:03:15
  GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:03:26

(172.16.254.6, 225.0.0.102), 1d06h/00:02:40, flags: MT
Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:28
  GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:03:28

(*, 225.0.0.101), 3d13h/00:03:13, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:02:59
  GigabitEthernet1/0/1, Forward/Sparse, 1d06h/00:02:53
  GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:03:13

(172.16.254.3, 225.0.0.101), 1d06h/00:03:09, flags: TA
Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d06h/00:03:27
  GigabitEthernet1/0/4, Forward/Sparse, 1d06h/00:03:13
Spine-02#

```

例：RP が BGP EVPN VXLAN ファブリックの内部にある場合の IPv4 および IPv6 のマルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

次に、スパインスイッチ 2 での `show ip mfib` コマンドの出力例を示します。

```
Spine-02# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
Loopback2 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 9/0/112/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/2   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/2   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 4/0/132/0, Other: 0/0/0
  HW Forwarding: 12790/0/177/0, Other: 0/0/0
GigabitEthernet1/0/1 Flags: A
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/4   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 27/0/101/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
```

```

SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 9381/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 3853/0/163/0, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 10/0/150/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 9007/0/167/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 2111/0/168/0, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
Spine-02#

```

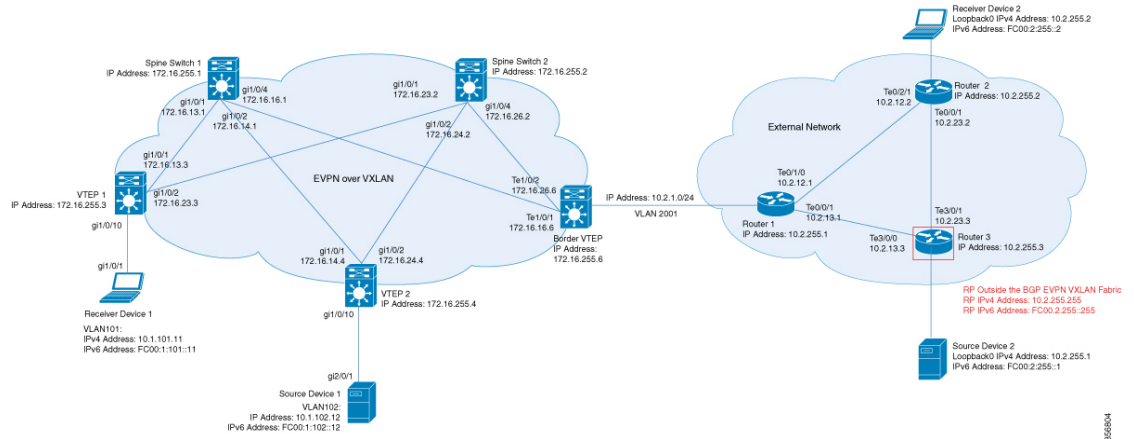
RPがBGP EVPN VXLAN ファブリックの内部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（109ページ）に戻ります。

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

次に、RPがBGP EVPN VXLAN ファブリックの外部にある場合に、IPv4マルチキャストトラフィックにPIM-SMを使用してレイヤ3 TRMを設定および確認する例を示します。この例では、次のトポロジを使用します。

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

図 12: RPがBGP EVPN VXLAN ファブリックの外部にある場合のPIM-SMでのTRM



このトポロジには2台のスパインスイッチと、3台のルータで外部ネットワークに接続された3台のVTEPを備えたEVPN VXLANネットワークが示されています。このトポロジでは、外部ネットワーク内のルータ3がRPとして機能し、ボーダーVTEPはルータ1を介してファブリックを外部ネットワークに接続します。このトポロジのIPv4マルチキャストグループは226.1.1.1です。次の表に、このトポロジのデバイスの設定例を示します。

表 9: RPがBGP EVPN VXLAN ファブリックの外部にある場合にIPv4マルチキャストトラフィックに対してPIM-SMを使用してTRMを設定するためのVTEP 1、ボーダーVTEP、およびVTEP 2の設定

VTEP 1	ボーダー VTEP	VTEP 2
	<pre> Border# show running-config hostname Border ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! vlan 2001 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! </pre>	

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre>Leaf-01# show running-config hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 !</pre>		<pre>Leaf-02# show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-famil ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 ! interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 !</pre>

VTEP 1	ボーダー VTEP	VTEP 2
<pre> interface GigabitEthernet1/0/2 no switchport ip address 172.16.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! </pre>	<pre> interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/2 no switchport ip address 172.16.26.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/5 switchport trunk allowed vlan 2001 switchport mode trunk ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate ! interface Vlan2001 vrf forwarding green ip address 10.2.1.1 255.255.255.0 ip mtu 1500 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 2 vrf green redistribute bgp 65001 </pre>	<pre> interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 102 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode no autostate ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! </pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre> address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Leaf-01# </pre>	<pre> ! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Border# </pre>	<pre> address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! end ! Leaf-02# </pre>

表 10: RPがBGP EVPN VXLAN ファブリックの外部にある場合にIPv4マルチキャストトラフィックに対してPIM-SMを使用してTRMを設定するためのスパインスイッチ1とスパインスイッチ2の設定

スパインスイッチ 1	スパインスイッチ 2
------------	------------

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

スパインスイッチ1	スパインスイッチ2
<pre> Spine-01# show running-config hostname Spine-01 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.14.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.16.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.1 ! router bgp 65001 bgp router-id 172.16.255.1 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! </pre>	<pre> Spine-02# show running-config hostname Spine-02 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.26.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.2 ! router bgp 65001 bgp router-id 172.16.255.2 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! </pre>

スパインスイッチ1	スパインスイッチ2
<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-01# </pre>	<pre> address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-02# </pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 11: RPがBGP EVPN VXLAN ファブリックの外部にある場合にIPv4マルチキャストトラフィックに対してPIM-SMを使用してTRMを設定するためのルータ1、ルータ2、およびルータ3の設定

ルータ 1	ルータ 2	ルータ 3
<pre> R1# show running-config hostname R1 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet0/0/1.2001 encapsulation dot1Q 2001 ip address 10.2.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 router ospf 1 router-id 10.2.255.1 ! ip pim rp-address 10.2.255.255 ! end ! R1# </pre>	<pre> R2# show running-config hostname R2 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.2 255.255.255.255 ip pim sparse-mode ip igmp join-group 226.1.1.1 ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 10.2.255.2 ! ip pim rp-address 10.2.255.255 ! end ! R2# </pre>	<pre> R3# show running-config hostname R3 ! ip multicast-routing distributed ! interface Loopback0 ip address 10.2.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback255 ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 10.2.255.3 ! ip pim rp-address 10.2.255.255 ! end ! R3# </pre>

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認

次の項では、上記で設定したトポロジのデバイスでPIM-SMを使用してTRMを確認するshowコマンドの出力例を示します。

- [VTEP 1 の設定を確認する出力 \(149 ページ\)](#)
- [VTEP 2 の設定を確認する出力 \(154 ページ\)](#)
- [ボーダー VTEP の設定を確認する出力 \(159 ページ\)](#)
- [スパインスイッチ 1 の設定を確認するための出力 \(165 ページ\)](#)
- [スパインスイッチ 2 の設定を確認するための出力 \(168 ページ\)](#)

- ルータ3 (BGPEVPN VXLAN ファブリックの外部にある RP) の設定を確認する出力 (172 ページ)

VTEP 1 の設定を確認する出力

次に、VTEP 1 での `show nve peers` コマンドの出力例を示します。

```
Leaf-01# show nve peers
Interface VNI      Type Peer-IP      RMAC/Num_RTs  eVNI      state flags UP time
nve1      50901    L3CP 172.16.254.6 0c75.bd67.ef48 50901      UP    A/-/4 16:44:02
nve1      50901    L3CP 172.16.254.4 7c21.0dbd.9548 50901      UP    A/-/4 16:41:00
nve1      50901    L3CP 172.16.254.6 0c75.bd67.ef48 50901      UP    A/M/6 16:44:02
nve1      50901    L3CP 172.16.254.4 7c21.0dbd.9548 50901      UP    A/M/6 16:41:00
nve1      10102    L2CP 172.16.254.4 7          10102      UP    N/A   16:23:05
nve1      10102    L2CP 172.16.254.6 5          10102      UP    N/A   16:44:02
Leaf-01#
```

次に、VTEP 1 での `show l2vpn evpn peers vxlan` コマンドの出力例を示します。

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP      Num routes eVNI      UP time
-----
nve1      10102    172.16.254.4 7          10102     16:23:06
nve1      10102    172.16.254.6 5          10102     16:44:02
Leaf-01#
```

次に、VTEP 1 での `show bgp ipv4 mvpn all summary` コマンドの出力例を示します。

```
Leaf-01# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 58, main routing table version 58
6 network entries using 1824 bytes of memory
8 path entries using 1088 bytes of memory
3/3 BGP path/bestpath attribute entries using 936 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 6404 total bytes of memory
BGP activity 117/25 prefixes, 240/113 paths, scan interval 60 secs
6 networks peaked at 12:17:52 Aug 6 2020 UTC (16:27:28.286 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   1217   1126    58    0    0 16:44:58      2
172.16.255.2  4      65001   1213   1121    58    0    0 16:44:53      2
Leaf-01#
```

次に、VTEP 1 での `show ip pim vrfvrf-name rp mapping` コマンドの出力例を示します。

```
Leaf-01# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
RP: 10.2.255.255 (?)
Leaf-01#
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

次に、VTEP 1 での **show ip routing vrf** コマンドの出力例を示します。

```
Leaf-01# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "bgp 65001", distance 200, metric 3, type internal
  Last update from 172.16.254.6 on Vlan901, 16:17:01 ago
  Routing Descriptor Blocks:
    * 172.16.254.6 (default), from 172.16.255.1, 16:17:01 ago, via Vlan901
      opaque_ptr 0x7FBB8620D990
      Route metric is 3, traffic share count is 1
      AS Hops 0
      MPLS label: none
Leaf-01#
```

次に、VTEP 1 での **show ip igmp vrf vrf-namegroups** コマンドの出力例を示します。

```
Leaf-01# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address      Interface          Uptime    Expires    Last Reporter    Group
Accounted
226.1.1.1          Vlan101           13:03:08  00:02:13   10.1.101.11
224.0.1.40         Loopback901       16:45:17  00:02:50   10.1.255.1
Leaf-01#
```

次に、VTEP 1 での **show ip mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-01# show ip mroute vrf green
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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       X - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 13:03:08/stopped, RP 10.2.255.255, flags: SJCg
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan101, Forward/Sparse, 13:03:08/00:02:13

(10.2.255.1, 226.1.1.1), 00:08:23/00:02:54, flags: TgQ
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan101, Forward/Sparse, 00:08:23/00:02:13

(10.1.102.12, 226.1.1.1), 00:08:48/00:02:24, flags: TgQ
  Incoming interface: Vlan901, RPF nbr 172.16.254.4
  Outgoing interface list:
    Vlan101, Forward/Sparse, 00:08:48/00:02:13
```

```
(* , 224.0.1.40), 16:45:17/00:02:50, RP 10.2.255.255, flags: SJCLg
Incoming interface: Vlan901, RPF nbr 172.16.254.6
Leaf-01#
```

次に、VTEP 1 での **show ip mfib vrf vrf-name** コマンドの出力例を示します。

```
Leaf-01# show ip mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 2/2/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A NS
  Loopback901 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,226.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A NS
  Vlan101 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(10.1.102.12,226.1.1.1) Flags: HW
  SW Forwarding: 5/0/100/0, Other: 0/0/0
  HW Forwarding: 523/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
Leaf-01#
```

次に、VTEP 1 での **show bgp ipv4 mvpn all** コマンドの出力例を示します。

```
Leaf-01# show bgp ipv4 mvpn all
BGP table version is 60, local router ID is 172.16.255.6
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
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 green)
*>i  [5][1:1][10.1.102.12][226.1.1.1]/18
      172.16.255.4          0      100      0 ?
* i   172.16.255.4          0      100      0 ?
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
*> [5][1:1][10.2.255.1][226.1.1.1]/18
      0.0.0.0                                32768 ?
* i [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
      172.16.255.3                            0 100 0 ?
*>i      172.16.255.3                            0 100 0 ?
* i [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
      172.16.255.3                            0 100 0 ?
*>i      172.16.255.3                            0 100 0 ?
*>i [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
      172.16.255.3                            0 100 0 ?
* i      172.16.255.3                            0 100 0 ?
Route Distinguisher: 172.16.254.4:102
*> [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
      0.0.0.0                                32768 ?
Leaf-01#
```

次に、VTEP 1 での **show ip mroute** コマンドの出力例を示します。

```
Leaf-01# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encaps-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 16:45:08/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 16:45:08/00:00:45

(172.16.254.4, 239.1.1.1), 00:08:47/00:01:59, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:08:47/00:00:12

(172.16.254.6, 239.1.1.1), 00:08:49/00:02:00, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:08:49/00:00:10

(*, 224.0.1.40), 16:45:17/00:02:46, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
Leaf-01#
```

次に、VTEP 1 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-01# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
```



```

ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Loopback0 Flags: F IC NS
Pkts: 0/0/0 Rate: 0 pps
(*,225.0.0.101) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 1/0/114/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
SW Forwarding: 13/0/127/0, Other: 2/2/0
HW Forwarding: 7870/0/164/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
(*,225.0.0.102) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 2/0/172/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
SW Forwarding: 1/0/154/0, Other: 0/0/0
HW Forwarding: 5222/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 1/0/154/0, Other: 0/0/0
HW Forwarding: 2137/0/163/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 11/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 4/0/150/0, Other: 0/0/0
HW Forwarding: 518/0/168/1, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 498/1/168/1, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
Leaf-01#
```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (148 ページ) に戻ります。

VTEP 2 の設定を確認する出力

次に、VTEP 2 での **show nve peers** コマンドの出力例を示します。

```
Leaf-02# show nve peers
Interface VNI Type Peer-IP RMAC/Num_RTs eVNI state flags UP time
nve1 50901 L3CP 172.16.254.6 0c75.bd67.ef48 50901 UP A/-/4 16:56:53
nve1 50901 L3CP 172.16.254.3 10b3.d56a.8fc8 50901 UP A/-/4 16:56:53
nve1 50901 L3CP 172.16.254.6 0c75.bd67.ef48 50901 UP A/M/6 16:56:53
nve1 50901 L3CP 172.16.254.3 10b3.d56a.8fc8 50901 UP A/M/6 16:56:53
nve1 10101 L2CP 172.16.254.3 6 10101 UP N/A 16:56:53
nve1 10102 L2CP 172.16.254.6 5 10102 UP N/A 16:56:53
Leaf-02#
```

次に、VTEP 2 での **show l2vpn evpn peers vxlan** コマンドの出力例を示します。

```
Leaf-02# show l2vpn evpn peers vxlan
Interface VNI Peer-IP Num routes eVNI UP time
-----
nve1 10101 172.16.254.3 6 10101 16:56:54
nve1 10102 172.16.254.6 5 10102 16:56:54
Leaf-02#
```

次に、VTEP 2 での **show bgp ipv4 mvpn all summary** コマンドの出力例を示します。

```
Leaf-02# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 62, main routing table version 62
7 network entries using 2128 bytes of memory
9 path entries using 1224 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7156 total bytes of memory
BGP activity 121/28 prefixes, 202/77 paths, scan interval 60 secs
9 networks peaked at 12:22:24 Aug 6 2020 UTC (16:43:21.423 ago)

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
172.16.255.1 4 65001 1229 1151 62 0 0 16:57:50 2
```

```
172.16.255.2 4 65001 1227 1152 62 0 0 16:57:51 2
Leaf-02#
```

次に、VTEP 2 での **show ip pim vrfvrf-name rp mapping** コマンドの出力例を示します。

```
Leaf-02# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
RP: 10.2.255.255 (?)
Leaf-02#
```

次に、VTEP 2 での **show ip routing vrf** コマンドの出力例を示します。

```
Leaf-02# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "bgp 65001", distance 200, metric 3, type internal
  Last update from 172.16.254.6 on Vlan901, 16:56:55 ago
  Routing Descriptor Blocks:
  * 172.16.254.6 (default), from 172.16.255.1, 16:56:55 ago, via Vlan901
    opaque_ptr 0x7F65B8B9E4B0
    Route metric is 3, traffic share count is 1
    AS Hops 0
    MPLS label: none
Leaf-02#
```

次に、VTEP 2 での **show ip igmp vrf vrf-namegroups** コマンドの出力例を示します。

```
Leaf-02# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address      Interface          Uptime    Expires    Last Reporter    Group
Accounted
226.1.1.1          Vlan102           16:58:00  00:02:11  10.1.102.12
224.0.1.40         Vlan901           16:58:37  00:02:33  172.16.254.4
Leaf-02#
```

次に、VTEP 2 での **show ip mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ip mroute vrf green
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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

例：RP が BGP EVPN VXLAN ファブリックの外部にある場合の IPv4 マルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

```
(* , 226.1.1.1), 16:58:00/stopped, RP 10.2.255.255, flags: SJCFg
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan102, Forward/Sparse, 16:58:00/00:02:11

(10.2.255.1, 226.1.1.1), 00:24:16/00:02:40, flags: JTgQ
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list:
    Vlan102, Forward/Sparse, 00:24:16/00:02:11

(10.1.102.12, 226.1.1.1), 00:24:41/00:02:09, flags: FTGqx
  Incoming interface: Vlan102, RPF nbr 0.0.0.0, Registering
  Outgoing interface list:
    Vlan901, Forward/Sparse, 00:24:41/stopped

(* , 224.0.1.40), 16:58:37/00:02:33, RP 10.2.255.255, flags: SJPCLgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.6
  Outgoing interface list: Null
Leaf-02#
```

次に、VTEP 2 での **show ip mfib vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ip mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/ES Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(* ,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(* ,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A IC NS
(* ,226.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 3/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A NS
  Vlan102 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(10.1.102.12,226.1.1.1) Flags: HW
  SW Forwarding: 739/0/100/0, Other: 2/2/0
  HW Forwarding: 736/0/118/0, Other: 0/0/0
  Vlan102 Flags: A
  Tunnel5 Flags: F
    Pkts: 0/0/739   Rate: 0 pps
  Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
    Pkts: 0/0/739   Rate: 0 pps
Leaf-02#
```

次に、VTEP 2 での **show bgp ipv4 mvpn all** コマンドの出力例を示します。

```
Leaf-02# show bgp ipv4 mvpn all
BGP table version is 62, local router ID is 172.16.255.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
*> [5][1:1][10.1.102.12][226.1.1.1]/18
      0.0.0.0
      32768 ?
*>i [5][1:1][10.2.255.1][226.1.1.1]/18
      172.16.255.6          0    100    0 ?
* i          172.16.255.6          0    100    0 ?
*> [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
      0.0.0.0
      32768 ?
*> [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
      0.0.0.0
      32768 ?
*>i [7][1:1][65001][10.1.102.12/32][226.1.1.1/32]/22
      172.16.255.3          0    100    0 ?
*> [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
      0.0.0.0
      32768 ?
Route Distinguisher: 172.16.254.4:102
*>i [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
      172.16.255.3          0    100    0 ?
* i          172.16.255.3          0    100    0 ?
Leaf-02#
```

次に、VTEP 2 での **show ip mroute** コマンドの出力例を示します。

```
Leaf-02# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,
       e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 16:58:28/stopped, RP 172.16.255.255, flags: SJCFx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Tunnel0, Forward/Sparse, 16:58:28/00:02:25

(172.16.254.6, 239.1.1.1), 00:24:42/00:00:58, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Tunnel0, Forward/Sparse, 00:24:42/00:02:17
(172.16.254.4, 239.1.1.1), 00:24:42/00:03:28, flags: FTx
Incoming interface: Loopback1, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 00:24:42/00:03:23, A
(*, 224.0.1.40), 16:58:37/00:02:26, RP 172.16.255.255, flags: SJCL
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Loopback0, Forward/Sparse, 16:58:36/00:02:26
Leaf-02#
```

次に、VTEP 2 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-02# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
                  e - Encap helper tunnel flag.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 2/0/170/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 1/0/150/0, Other: 0/0/0
  HW Forwarding: 7870/0/176/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1/0/224/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 2/0/163/0, Other: 3/1/2
```

```

HW Forwarding: 5353/0/164/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 1/0/206/0, Other: 0/0/0
HW Forwarding: 2165/0/163/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 5/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 1495/1491/4
HW Forwarding: 742/0/156/0, Other: 0/0/0
Null0 Flags: A NS
GigabitEthernet1/0/2 Flags: F
Pkts: 0/0/1 Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 1460/1/168/1, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
Leaf-02#
    
```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4 マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (148 ページ) に戻ります。

ボーダー VTEP の設定を確認する出力

次に、ボーダー VTEP での `show nve peers` コマンドの出力例を示します。

```

Border# show nve peers
Interface VNI      Type Peer-IP          RMAC/Num_RTs  eVNI      state flags UP time
nve1      50901    L3CP 172.16.254.3    10b3.d56a.8fc8 50901     UP  A/-/4 17:09:20
nve1      50901    L3CP 172.16.254.4    7c21.0dbd.9548 50901     UP  A/-/4 17:06:19
nve1      50901    L3CP 172.16.254.3    10b3.d56a.8fc8 50901     UP  A/M/6 17:09:20
nve1      50901    L3CP 172.16.254.4    7c21.0dbd.9548 50901     UP  A/M/6 17:06:19
nve1      10101    L2CP 172.16.254.3     6             10101     UP  N/A   17:09:20
nve1      10102    L2CP 172.16.254.4     7             10102     UP  N/A   16:48:24
Border#
    
```

次に、ボーダー VTEP での `show l2vpn evpn peers vxlan` コマンドの出力例を示します。

ボーダー VTEP

```

Border# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP          Num routes eVNI      UP time
-----
nve1      10101    172.16.254.3    6          10101     17:09:21
nve1      10102    172.16.254.4    7          10102     16:48:24
Border#
    
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

次に、ボーダーVTEPでの **show bgp ipv4 mvpn all summary** コマンドの出力例を示します。

```
Border# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 60, main routing table version 60
6 network entries using 1824 bytes of memory
10 path entries using 1360 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
19 BGP extended community entries using 2682 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7298 total bytes of memory
BGP activity 116/24 prefixes, 232/112 paths, scan interval 60 secs
8 networks peaked at 12:14:22 Aug 6 2020 UTC (16:52:46.174 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1  4      65001  1246   1165     60    0   0 17:13:17      4
172.16.255.2  4      65001  1247   1161     60    0   0 17:13:14      4
Border#
```

次に、ボーダーVTEPでの **show ip pim vrf vrf-namerp mapping** コマンドの出力例を示します。

```
Border# show ip pim vrf green rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 10.2.255.255 (?)
Border#
```

次に、ボーダーVTEPでの **show ip routing vrf vrf-name** コマンドの出力例を示します。

```
Border# show ip routing vrf green 10.2.255.255
Routing Table: green
Routing entry for 10.2.255.255/32
  Known via "ospf 2", distance 110, metric 3, type intra area
  Redistributing via bgp 65001
  Advertised by bgp 65001 match internal external 1 & 2
  Last update from 10.2.1.2 on Vlan2001, 17:12:42 ago
  Routing Descriptor Blocks:
  * 10.2.1.2, from 10.2.255.3, 17:12:42 ago, via Vlan2001
    Route metric is 3, traffic share count is 1
Border#
```

次に、ボーダーVTEPでの **show ip igmp vrf vrf-namegroups** コマンドの出力例を示します。

```
Border# show ip igmp vrf green groups
IGMP Connected Group Membership
Group Address      Interface      Uptime      Expires      Last Reporter      Group
Accounted
224.0.1.40         Vlan901       17:14:13    00:02:51    172.16.254.6
Border#
```


次に、ボーダーVTEPでの **show ip mroute vrf vrf-name** コマンドの出力例を示します。

```

Border# show ip mroute vrf green
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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFF-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encaps-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 17:06:19/stopped, RP 10.2.255.255, flags: SJGx
  Incoming interface: Vlan2001, RPF nbr 10.2.1.2
  Outgoing interface list:
    Vlan901, Forward/Sparse, 17:06:19/stopped

(10.2.255.1, 226.1.1.1), 00:33:41/00:01:22, flags: TGqx
  Incoming interface: Vlan2001, RPF nbr 10.2.1.2
  Outgoing interface list:
    Vlan901, Forward/Sparse, 00:33:41/stopped

(10.1.102.12, 226.1.1.1), 00:34:06/00:03:14, flags: Tgx
  Incoming interface: Vlan901, RPF nbr 172.16.254.4
  Outgoing interface list:
    Vlan2001, Forward/Sparse, 00:34:06/00:02:52, A

(*, 224.0.1.40), 17:14:13/00:02:51, RP 10.2.255.255, flags: SJCLGx
  Incoming interface: Vlan2001, RPF nbr 10.2.1.2
  Outgoing interface list:
    Vlan901, Forward/Sparse, 17:14:12/00:02:51
Border#
    
```

次に、ボーダーVTEPでの **show ip mfib vrf vrf-name** コマンドの出力例を示します。

```

Border# show ip mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps
    
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
VRF green
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
Vlan2001 Flags: A NS
Vlan901, VXLAN Decap Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,226.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 6/0/122/0, Other: 0/0/0
Vlan2001 Flags: A NS
Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
  Pkts: 0/0/0   Rate: 0 pps
(10.1.102.12,226.1.1.1) Flags: HW
  SW Forwarding: 4/0/100/0, Other: 1/1/0
  HW Forwarding: 2096/1/126/0, Other: 0/0/0
Vlan901, VXLAN Decap Flags: A
Vlan2001 Flags: F
  Pkts: 0/0/4   Rate: 0 pps
(10.2.255.1,226.1.1.1) Flags: HW
  SW Forwarding: 1/0/100/0, Other: 0/0/0
  HW Forwarding: 2072/1/122/0, Other: 0/0/0
Vlan2001 Flags: A
Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
  Pkts: 0/0/1   Rate: 0 pps
Border#
```

次に、ボーダー VTEP での **show bgp ipv4 mvpn all** コマンドの出力例を示します。

```
Border# show bgp ipv4 mvpn all
BGP table version is 60, local router ID is 172.16.255.6
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
*>i  [5] [1:1] [10.1.102.12] [226.1.1.1] /18
      172.16.255.4          0      100      0 ?
* i   [5] [1:1] [10.2.255.1] [226.1.1.1] /18
      0.0.0.0                32768 ?
* i   [6] [1:1] [65001] [10.2.255.255/32] [224.0.1.40/32] /22
      172.16.255.3          0      100      0 ?
*>i   [6] [1:1] [65001] [10.2.255.255/32] [226.1.1.1/32] /22
      172.16.255.3          0      100      0 ?
*>i   [6] [1:1] [65001] [10.2.255.255/32] [226.1.1.1/32] /22
      172.16.255.3          0      100      0 ?
*>i   [7] [1:1] [65001] [10.2.255.1/32] [226.1.1.1/32] /22
      172.16.255.3          0      100      0 ?
* i   [7] [1:1] [65001] [10.2.255.1/32] [226.1.1.1/32] /22
      172.16.255.3          0      100      0 ?
Route Distinguisher: 172.16.254.4:102
*>   [7] [172.16.254.4:102] [65001] [10.1.102.12/32] [226.1.1.1/32] /22
      0.0.0.0                32768 ?
Border#
```

次に、ボーダーVTEPでのshow ip mroute コマンドの出力例を示します。

```
Border# show 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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFF-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 17:14:04/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 17:14:04/00:01:48

(172.16.254.4, 239.1.1.1), 00:34:05/00:02:44, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:34:05/00:01:54

(172.16.254.6, 239.1.1.1), 00:34:07/00:03:12, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 00:34:07/00:02:52, A

(*, 224.0.1.40), 17:14:13/00:02:47, RP 172.16.255.255, flags: SJCL
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 17:14:12/00:02:47
Border#
```

次に、ボーダーVTEPでのshow ip mfib コマンドの出力例を示します。

```
Border# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  8/0/146/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 7/0/125/0, Other: 0/0/0
  HW Forwarding:  8010/0/176/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/7   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  1/0/172/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding:  5353/0/176/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 11/0/167/0, Other: 7/6/1
  HW Forwarding:  2207/0/151/0, Other: 0/0/0
  Null0 Flags: A
  TenGigabitEthernet1/0/2 Flags: F
  Pkts: 0/0/10  Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  8/0/168/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
  SW Forwarding: 4/0/150/0, Other: 0/0/0
  HW Forwarding:  2032/1/168/1, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/4   Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
  SW Forwarding: 2/0/150/0, Other: 4/4/0
  HW Forwarding:  2015/1/156/1, Other: 0/0/0
  Null0 Flags: A
  TenGigabitEthernet1/0/2 Flags: F
  Pkts: 0/0/1   Rate: 0 pps
Border#

```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（148ページ）に戻ります。

スパインスイッチ1の設定を確認するための出力

次に、スパインスイッチ1での `show bgp ipv4 mvpn all summary` コマンドの出力例を示します。

```
Spine-01# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 169, main routing table version 169
6 network entries using 1824 bytes of memory
16 path entries using 2176 bytes of memory
3/3 BGP path/bestpath attribute entries using 912 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
16 BGP extended community entries using 2332 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7388 total bytes of memory
BGP activity 250/203 prefixes, 2984/2883 paths, scan interval 60 secs
8 networks peaked at 12:20:11 Aug 6 2020 UTC (16:59:40.011 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.2  4      65001  1632   1581    169   0    0  20:28:37      6
172.16.255.3  4      65001  1161   1252    169   0    0  17:17:09      4
172.16.255.4  4      65001  1169   1247    169   0    0  17:14:09      4
172.16.255.6  4      65001  1172   1253    169   0    0  17:20:10      2
Spine-01#
```

次に、スパインスイッチ1での `show ip pim rp mapping` コマンドの出力例を示します。

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)
Spine-01#
```

次に、スパインスイッチ1での `show bgp ipv4 mvpn all` コマンドの出力例を示します。

```
Spine-01# show bgp ipv4 mvpn all
BGP table version is 169, local router ID is 172.16.255.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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
* i   [5][1:1][10.1.102.12][226.1.1.1]/18
      172.16.255.4          0    100    0 ?
*>i   172.16.255.4          0    100    0 ?
* i   [5][1:1][10.2.255.1][226.1.1.1]/18
      172.16.255.6          0    100    0 ?
*>i   172.16.255.6          0    100    0 ?
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
* i [6] [1:1] [65001] [10.2.255.255/32] [224.0.1.40/32]/22
      172.16.255.4          0 100 0 ?
*>i  172.16.255.3          0 100 0 ?
* i  172.16.255.3          0 100 0 ?
*>i [6] [1:1] [65001] [10.2.255.255/32] [226.1.1.1/32]/22
      172.16.255.3          0 100 0 ?
* i  172.16.255.3          0 100 0 ?
* i  172.16.255.4          0 100 0 ?
*>i [7] [1:1] [65001] [10.2.255.1/32] [226.1.1.1/32]/22
      172.16.255.3          0 100 0 ?
* i  172.16.255.3          0 100 0 ?
* i  172.16.255.4          0 100 0 ?
Route Distinguisher: 172.16.254.4:102
*>i [7] [172.16.254.4:102] [65001] [10.1.102.12/32] [226.1.1.1/32]/22
      172.16.255.3          0 100 0 ?
* i  172.16.255.3          0 100 0 ?
* i  172.16.255.6          0 100 0 ?
Spine-01#
```

次に、スパインスイッチ1での **show ip mroute** コマンドの出力例を示します。

```
Spine-01# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 00:42:45/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 239.1.1.1), 00:42:22/00:02:37, flags: PTA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 239.1.1.1), 00:42:45/00:02:28, flags: PTA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(*, 224.0.1.40), 1w0d/00:02:18, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w0d/00:02:18

(*, 225.0.0.102), 6d19h/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.6, 225.0.0.102), 05:29:52/00:02:22, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
```

```

Outgoing interface list: Null

(172.16.254.4, 225.0.0.102), 17:12:35/00:02:03, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null
Spine-01#

```

次に、スパインスイッチ1での **show ip mfib** コマンドの出力例を示します。

```

Spine-01# show ip mfib
Entry Flags:    C - Directly Connected, S - Signal, IA - Inherit A flag,
                ET - Data Rate Exceeds Threshold, K - Keepalive
                DDE - Data Driven Event, HW - Hardware Installed
                ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                NS - Negate Signalling, SP - Signal Present,
                A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                MA - MFIB Accept, A2 - Accept backup,
                RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 82/82/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  Loopback2 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 1/0/206/0, Other: 279/0/279
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  GigabitEthernet1/0/2 Flags: NS
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  GigabitEthernet1/0/4 Flags: NS
(*,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 1/0/1
  HW Forwarding: 0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
(172.16.254.4,239.1.1.1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1224/0/168/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
(172.16.254.6,239.1.1.1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A NS
Spine-01#
```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（148ページ）に戻ります。

スパインスイッチ2の設定を確認するための出力

次に、スパインスイッチ2での `show bgp ipv4 mvpn all summary` コマンドの出力例を示します。

```
Spine-02# show bgp ipv4 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 131, main routing table version 131
6 network entries using 1824 bytes of memory
16 path entries using 2176 bytes of memory
3/3 BGP path/bestpath attribute entries using 912 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
16 BGP extended community entries using 2332 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7388 total bytes of memory
BGP activity 283/236 prefixes, 3089/2988 paths, scan interval 60 secs
8 networks peaked at 12:20:59 Aug 6 2020 UTC (17:02:43.558 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   1584   1635    131   0    0  20:31:41      6
172.16.255.3  4      65001   1160   1252    131   0    0  17:20:09      4
172.16.255.4  4      65001   1173   1249    131   0    0  17:17:14      4
172.16.255.6  4      65001   1172   1258    131   0    0  17:23:12      2
Spine-02#
```

次に、スパインスイッチ2での `show ip pim rp mapping` コマンドの出力例を示します。

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
RP: 172.16.255.255 (?)
Spine-02#
```

次に、スパインスイッチ2での `show bgp ipv4 mvpn all` コマンドの出力例を示します。

```
Spine-02# show bgp ipv4 mvpn all
BGP table version is 131, local router ID is 172.16.255.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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
* i  [5][1:1][10.1.102.12][226.1.1.1]/18
      172.16.255.4      0    100    0 ?
```



```

*>i          172.16.255.4          0 100 0 ?
* i [5][1:1][10.2.255.1][226.1.1.1]/18
          172.16.255.6          0 100 0 ?
*>i          172.16.255.6          0 100 0 ?
* i [6][1:1][65001][10.2.255.255/32][224.0.1.40/32]/22
          172.16.255.4          0 100 0 ?
*>i          172.16.255.3          0 100 0 ?
* i          172.16.255.3          0 100 0 ?
*>i [6][1:1][65001][10.2.255.255/32][226.1.1.1/32]/22
          172.16.255.3          0 100 0 ?
* i          172.16.255.3          0 100 0 ?
* i          172.16.255.4          0 100 0 ?
*>i [7][1:1][65001][10.2.255.1/32][226.1.1.1/32]/22
          172.16.255.3          0 100 0 ?
* i          172.16.255.3          0 100 0 ?
* i          172.16.255.4          0 100 0 ?
Route Distinguisher: 172.16.254.4:102
*>i [7][172.16.254.4:102][65001][10.1.102.12/32][226.1.1.1/32]/22
          172.16.255.3          0 100 0 ?
* i          172.16.255.3          0 100 0 ?
* i          172.16.255.6          0 100 0 ?
Spine-02#

```

次に、スパインスイッチ2での **show ip mroute** コマンドの出力例を示します。

```

Spine-02# show 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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 3d00h/00:03:23, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:23
    GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:17
    GigabitEthernet1/0/4, Forward/Sparse, 17:23:12/00:02:52

(172.16.254.4, 239.1.1.1), 00:44:04/00:01:34, flags: T
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 00:44:04/00:02:52
    GigabitEthernet1/0/1, Forward/Sparse, 00:44:04/00:03:17

(172.16.254.6, 239.1.1.1), 00:44:04/00:01:32, flags: T
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 00:44:04/00:03:17
    GigabitEthernet1/0/2, Forward/Sparse, 00:44:04/00:03:23

```

例: RP が BGP EVPN VXLAN ファブリックの外部にある場合の IPv4 マルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

```
(* , 224.0.1.40), 1w0d/00:03:22, RP 172.16.255.255, flags: SJCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:02:46
  GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:22
  GigabitEthernet1/0/4, Forward/Sparse, 17:23:12/00:03:13
  Loopback2, Forward/Sparse, 1w0d/00:02:33

(* , 225.0.0.102), 1w0d/00:03:29, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:04
  GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:29
  GigabitEthernet1/0/4, Forward/Sparse, 17:23:12/00:02:36

(172.16.254.4, 225.0.0.102), 17:17:08/00:02:44, flags: MT
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 17:17:08/00:02:37
  GigabitEthernet1/0/1, Forward/Sparse, 17:17:08/00:03:29

(172.16.254.6, 225.0.0.102), 17:23:14/00:03:21, flags: MT
Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:04
  GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:29

(* , 225.0.0.101), 3d00h/00:03:10, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:01
  GigabitEthernet1/0/1, Forward/Sparse, 17:20:16/00:03:10
  GigabitEthernet1/0/4, Forward/Sparse, 17:23:12/00:02:40

(172.16.254.3, 225.0.0.101), 17:19:56/00:02:53, flags: TA
Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 17:17:14/00:03:01
  GigabitEthernet1/0/4, Forward/Sparse, 17:19:56/00:03:02
Spine-02#
```

次に、スパインスイッチ 2 での **show ip mfib** コマンドの出力例を示します。

```
Spine-02# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
                   SW Forwarding: 0/0/0/0, Other: 0/0/0
```

```

HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
Loopback2 Flags: F IC NS
Pkts: 0/0/0 Rate: 0 pps
(*,225.0.0.101) Flags: C HW
SW Forwarding: 9/0/112/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/2 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/2 Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
SW Forwarding: 4/0/132/0, Other: 0/0/0
HW Forwarding: 8067/0/176/0, Other: 0/0/0
GigabitEthernet1/0/1 Flags: A
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
(*,225.0.0.102) Flags: C HW
SW Forwarding: 27/0/101/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 5404/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 2214/0/163/0, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A NS
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 9/0/150/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/3   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/3   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/3   Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 2629/1/168/1, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 2607/1/168/1, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
Spine-02#
```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (148 ページ) に戻ります。

ルータ 3 (BGP EVPN VXLAN ファブリックの外部にある RP) の設定を確認する出力

次に、ルータ 3 での `show ip pim rp mapping` コマンドの出力例を示します。

```
R3# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 10.2.255.255 (?)
R3#
```

次に、ルータ 3 での `show ip mroute` コマンドの出力例を示します。

```
R3# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 226.1.1.1), 2d19h/00:03:17, RP 10.2.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
```

```

Outgoing interface list:
  TenGigabitEthernet0/0/0, Forward/Sparse, 17:10:20/00:03:17
  TenGigabitEthernet0/0/1, Forward/Sparse, 2d16h/00:03:11

(10.2.255.1, 226.1.1.1), 00:37:40/00:02:14, flags: PJT
  Incoming interface: TenGigabitEthernet0/0/0, RPF nbr 10.2.13.1
  Outgoing interface list: Null

(10.1.102.12, 226.1.1.1), 00:38:05/00:02:58, flags: P
  Incoming interface: TenGigabitEthernet0/0/0, RPF nbr 10.2.13.1
  Outgoing interface list: Null

(*, 224.0.1.40), 2d23h/00:03:27, RP 10.2.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback0, Forward/Sparse, 2d23h/00:02:11
    TenGigabitEthernet0/0/1, Forward/Sparse, 2d19h/00:03:26
    TenGigabitEthernet0/0/0, Forward/Sparse, 2d19h/00:03:27
R3#

```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4マルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (148ページ) に戻ります。

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

この例では、RPがBGP EVPN VXLAN ファブリックの外部にある場合にIPv4およびIPv6のマルチキャストトラフィックにPIM-SMを使用してレイヤ3 TRMを設定し、確認する方法を示します。この例では、[図 12：RPがBGP EVPN VXLAN ファブリックの外部にある場合のPIM-SMでのTRM \(140ページ\)](#) のトポロジを示します。

このトポロジには2台のスパインスイッチと、3台のルータで外部ネットワークに接続された3台のVTEPを備えたEVPN VXLANネットワークが示されています。このトポロジでは、外部ネットワーク内のルータ3がRPとして機能し、ボーダーVTEPはルータ1を介してファブリックを外部ネットワークに接続します。このトポロジでは、IPv4マルチキャストグループは226.1.1.1、IPv6マルチキャストグループはFF06:1::1です。次の表に、このトポロジのデバイスの設定例を示します。

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4 およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 12: RPがBGP EVPN VXLAN ファブリックの外部にある場合にIPv4 および IPv6のマルチキャストトラフィックにPIM-SMを使用してTRMを設定するためのVTEP 1、ボーダー VTEP、および VTEP 2の設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre>Leaf-01# show running-config hostname Leaf-01 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901</pre>	<pre>Border# show running-config hostname Border ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>	<pre>Leaf-02# show running-config hostname Leaf-02 ! vrf definition green rd 1:1 ! address-family ipv4 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! address-family ipv6 mdt auto-discovery vxlan mdt default vxlan 239.1.1.1 mdt overlay use-bgp route-target export 1:1 route-target import 1:1 route-target export 1:1 stitching route-target import 1:1 stitching exit-address-family ! ip routing ! ip multicast-routing ip multicast-routing vrf green ! ipv6 unicast-routing ipv6 multicast-routing vrf green ! l2vpn evpn replication-type static router-id Loopback1 default-gateway advertise ! l2vpn evpn instance 101 vlan-based encapsulation vxlan ! l2vpn evpn instance 102 vlan-based encapsulation vxlan ! system mtu 9198 ! vlan configuration 101 member evpn-instance 101 vni 10101 vlan configuration 102 member evpn-instance 102 vni 10102 vlan configuration 901 member vni 50901 !</pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ポーター VTEP	VTEP 2
<pre> ! interface Loopback0 ip address 172.16.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback901 vrf forwarding green ip address 10.1.255.1 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::1/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! </pre>	<pre> vlan 2001 ! interface Loopback0 ip address 172.16.255.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.6 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback901 vrf forwarding green ip address 10.1.255.4 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::4/128 ipv6 enable ! interface TenGigabitEthernet1/0/1 no switchport ip address 172.16.16.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/2 no switchport ip address 172.16.26.6 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface TenGigabitEthernet1/0/5 switchport trunk allowed vlan 2001 switchport mode trunk ! interface TenGigabitEthernet1/0/10 switchport access vlan 102 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! </pre>	<pre> interface Loopback0 ip address 172.16.255.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.4 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface Loopback901 vrf forwarding green ip address 10.1.255.2 255.255.255.255 ip pim sparse-mode ipv6 address FC00:1:255::2/128 ipv6 enable ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.14.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.4 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/10 switchport access vlan 101 switchport mode access ! interface Vlan101 vrf forwarding green ip address 10.1.101.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:101::1/64 ipv6 enable ! interface Vlan102 vrf forwarding green ip address 10.1.102.1 255.255.255.0 ip pim sparse-mode ipv6 address FC00:1:102::1/64 ipv6 enable ! interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! </pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre>interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.3 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family !</pre>	<pre>interface Vlan901 vrf forwarding green ip unnumbered Loopback1 ip pim sparse-mode ipv6 enable no autostate ! interface Vlan2001 vrf forwarding green ip address 10.2.1.1 255.255.255.0 ip mtu 1500 ip pim sparse-mode ip ospf network point-to-point ip ospf 2 area 0 ipv6 address FC00:2:1::1/64 ipv6 enable ipv6 mtu 1500 ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospfv3 1 ! address-family ipv6 unicast vrf green redistribute bgp 65001 exit-address-family ! router ospf 2 vrf green redistribute bgp 65001 ! router ospf 1 router-id 172.16.255.6 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0</pre>	<pre>interface nve1 no ip address source-interface Loopback1 host-reachability protocol bgp member vni 10101 mcast-group 225.0.0.101 member vni 50901 vrf green member vni 10102 mcast-group 225.0.0.102 ! router ospf 1 router-id 172.16.255.4 ! router bgp 65001 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 ! address-family ipv4 redistribute connected redistribute static exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family !</pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

VTEP 1	ボーダー VTEP	VTEP 2
<pre> address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-01# </pre>	<pre> ! address-family ipv4 exit-address-family ! address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both exit-address-family ! address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static redistribute ospf 2 match internal external 1 external 2 exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute ospf 1 include-connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ! end ! Border# </pre>	<pre> address-family ipv4 vrf green advertise l2vpn evpn redistribute connected redistribute static exit-address-family ! address-family ipv6 vrf green redistribute connected redistribute static advertise l2vpn evpn exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip pim vrf green rp-address 10.2.255.255 ! ipv6 pim vrf green rp-address FC00:2:255::255 ipv6 pim vrf green register-source Loopback901 ! end ! Leaf-02# </pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 13: RPがBGP EVPN VXLAN ファブリックの外部にある場合にIPv4 およびIPv6 のマルチキャストにPIM-SMを使用してTRMを設定するためのスパインスイッチ 1およびスパインスイッチ 2の設定

スパインスイッチ 1	スパインスイッチ 2

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

スパインスイッチ1	スパインスイッチ2
<pre> Spine-01# show running-config hostname Spine-01 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.1 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.14.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.16.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.1 ! router bgp 65001 bgp router-id 172.16.255.1 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.2 remote-as 65001 neighbor 172.16.255.2 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! address-family ipv4 exit-address-family ! </pre>	<pre> Spine-02# show running-config hostname Spine-02 ! ip routing ! ip multicast-routing ! system mtu 9198 ! interface Loopback0 ip address 172.16.255.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback1 ip address 172.16.254.2 255.255.255.255 ip ospf 1 area 0 ! interface Loopback2 ip address 172.16.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ! interface GigabitEthernet1/0/1 no switchport ip address 172.16.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/2 no switchport ip address 172.16.24.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! interface GigabitEthernet1/0/4 no switchport ip address 172.16.26.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ! router ospf 1 router-id 172.16.255.2 ! router bgp 65001 bgp router-id 172.16.255.2 bgp log-neighbor-changes no bgp default ipv4-unicast neighbor 172.16.255.1 remote-as 65001 neighbor 172.16.255.1 update-source Loopback0 neighbor 172.16.255.3 remote-as 65001 neighbor 172.16.255.3 update-source Loopback0 neighbor 172.16.255.4 remote-as 65001 neighbor 172.16.255.4 update-source Loopback0 neighbor 172.16.255.6 remote-as 65001 neighbor 172.16.255.6 update-source Loopback0 ! address-family ipv4 exit-address-family ! </pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

スパインスイッチ1	スパインスイッチ2
<pre> address-family ipv4 mvpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.2 activate neighbor 172.16.255.2 send-community both neighbor 172.16.255.2 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.2 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-01# </pre>	<pre> address-family ipv4 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family ipv6 mvpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! address-family l2vpn evpn neighbor 172.16.255.1 activate neighbor 172.16.255.1 send-community both neighbor 172.16.255.1 route-reflector-client neighbor 172.16.255.3 activate neighbor 172.16.255.3 send-community both neighbor 172.16.255.3 route-reflector-client neighbor 172.16.255.4 activate neighbor 172.16.255.4 send-community both neighbor 172.16.255.4 route-reflector-client neighbor 172.16.255.6 activate neighbor 172.16.255.6 send-community both neighbor 172.16.255.6 route-reflector-client exit-address-family ! ip pim rp-address 172.16.255.255 ip pim ssm default ip msdp peer 172.16.254.1 connect-source Loopback1 remote-as 65001 ip msdp cache-sa-state ! end ! Spine-02# </pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

表 14:RPがBGP EVPN VXLAN ファブリックの外部にある場合に、IPv4 および IPv6 のマルチキャストトラフィックにPIM-SMを使用してTRMを設定するためのルータ 1、ルータ 2、およびルータ 3の設定

ルータ 1	ルータ 2	ルータ 3
<pre> R1# show running-config hostname R1 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.1 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::1/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:12::1/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.13.1 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:13::1/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface GigabitEthernet0/0/1.2001 encapsulation dot1Q 2001 ip address 10.2.1.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 ipv6 address FC00:2:1::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 </pre>	<pre> R2# show running-config hostname R2 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.2 255.255.255.255 ip pim sparse-mode ip igmp join-group 226.1.1.1 ip ospf 1 area 0 ipv6 address FC00:2:255::2/128 ipv6 enable ipv6 mld join-group FF06:1::1 ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.12.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:12::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.2 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:23::2/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.2 </pre>	<pre> R3# show running-config hostname R3 ! ip multicast-routing distributed ! ipv6 unicast-routing ipv6 multicast-routing ! interface Loopback0 ip address 10.2.255.3 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::3/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface Loopback255 ip address 10.2.255.255 255.255.255.255 ip pim sparse-mode ip ospf 1 area 0 ipv6 address FC00:2:255::255/128 ipv6 enable ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/0 ip address 10.2.13.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:13::3/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! interface TenGigabitEthernet0/0/1 ip address 10.2.23.3 255.255.255.0 ip pim sparse-mode ip ospf network point-to-point ip ospf 1 area 0 cdp enable ipv6 address FC00:2:23::3/64 ipv6 enable ospfv3 network point-to-point ospfv3 1 ipv6 area 0 ! router ospfv3 1 ! </pre>

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

ルータ 1	ルータ 2	ルータ 3
<pre>! router ospfv3 1 ! address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.1 ! ip pim rp-address 10.2.255.255 ! ipv6 pim rp-address FC00:2:255::255 ! end ! R1#</pre>	<pre>! ip pim rp-address 10.2.255.255 ! ipv6 pim rp-address FC00:2:255::255 ! end ! R2#</pre>	<pre>address-family ipv6 unicast exit-address-family ! router ospf 1 router-id 10.2.255.3 ! ip pim rp-address 10.2.255.255 ! ipv6 pim rp-address FC00:2:255::255 ! end ! R3#</pre>

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認

次の項では、上記で設定したトポロジのデバイスでPIM-SMを使用してTRMを確認するshowコマンドの出力例を示します。

- [VTEP 1 の設定を確認する出力 \(182 ページ\)](#)
- [VTEP 2 の設定を確認する出力 \(190 ページ\)](#)
- [ボーダー VTEP の設定を確認する出力 \(197 ページ\)](#)
- [スパインスイッチ 1 の設定を確認するための出力 \(205 ページ\)](#)
- [スパインスイッチ 2 の設定を確認するための出力 \(208 ページ\)](#)
- [ルータ 3 \(BGPEVPN VXLANファブリックの外部にあるRP\) の設定を確認する出力 \(212 ページ\)](#)

VTEP 1 の設定を確認する出力

次に、VTEP 1 での `show nve peers` コマンドの出力例を示します。

```
Leaf-01# show nve peers
Interface VNI      Type Peer-IP          RMAC/Num_RTs  eVNI      state flags UP time
nve1      50901  L3CP 172.16.254.6    0c75.bd67.ef48 50901     UP    A/-/4 1d01h
nve1      50901  L3CP 172.16.254.4     7c21.0dbd.9548 50901     UP    A/-/4 1d01h
nve1      50901  L3CP 172.16.254.6     0c75.bd67.ef48 50901     UP    A/M/6 1d01h
nve1      50901  L3CP 172.16.254.4     7c21.0dbd.9548 50901     UP    A/M/6 1d01h
nve1      10102  L2CP 172.16.254.4     7                10102     UP    N/A   1d00h
nve1      10102  L2CP 172.16.254.6     5                10102     UP    N/A   1d01h
Leaf-01#
```

次に、VTEP 1 での `show l2vpn evpn peers vxlan` コマンドの出力例を示します。

```
Leaf-01# show l2vpn evpn peers vxlan
Interface VNI      Peer-IP              Num routes eVNI      UP time
-----
nve1      10102             172.16.254.4         7                    10102    1d00h
nve1      10102             172.16.254.6         5                    10102    1d01h
Leaf-01#
```

次に、VTEP 1 での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Leaf-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.3, local AS number 65001
BGP table version is 43, main routing table version 43
5 network entries using 1960 bytes of memory
7 path entries using 1120 bytes of memory
3/3 BGP path/bestpath attribute entries using 936 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 6572 total bytes of memory
BGP activity 124/30 prefixes, 253/123 paths, scan interval 60 secs
5 networks peaked at 15:46:09 Aug 6 2020 UTC (21:27:07.275 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001   1796   1688    43    0    0  1d01h    2
172.16.255.2  4      65001   1795   1685    43    0    0  1d01h    2
Leaf-01#
```

次に、VTEP 1 での **show ipv6 pim vrfvrf-name group-map** コマンドの出力例を示します。

```
Leaf-01# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
  SM, RP: FC00:2:255::255
  RPF: V1901,::FFFF:172.16.254.6
  Info source: Static
  Uptime: 21:43:02, Groups: 1
Leaf-01#
```

次に、VTEP 1 での **show ipv6 routing vrf** コマンドの出力例を示します。

```
Leaf-01# show ipv6 routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "bgp 65001", distance 200, metric 2, type internal
  Route count is 1/1, share count 0
  Routing paths:
    172.16.254.6%default, Vlan901%default
    From AC10:FF01::
    opaque_ptr 0x7FBB863DE268
    Last updated 1d00h ago
Leaf-01#
```

次に、VTEP 1 での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Leaf-01# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                               Interface
      Uptime      Expires
FF06:1::1                                     Vlan101
      21:30:55   00:03:57
Leaf-01#
```

次に、VTEP 1 での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-01# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       n - BGP Shared-Tree Prune received, N - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 21:30:55/00:03:08, RP FC00:2:255::255, flags: SCJg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Immediate Outgoing interface list:
    Vlan101, Forward, 21:30:55/00:03:08

(FC00:1:102::12, FF06:1::1), 00:01:55/00:01:34, flags: SJTgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.4
  Immediate Outgoing interface list:
    Vlan101, Forward, 00:01:55/00:02:38

(FC00:2:255::1, FF06:1::1), 00:01:14/00:02:15, flags: SJTgQ
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Immediate Outgoing interface list:
    Vlan101, Forward, 00:01:14/00:03:18
Leaf-01#
```

次に、VTEP 1 での **show ipv6 mfib vrf vrf-name** コマンドの出力例を示します。

```
Leaf-01# show ipv6 mfib vrf green
Entry Flags:   C - Directly Connected, S - Signal, IA - Inherit A flag,
              ET - Data Rate Exceeds Threshold, K - Keepalive
              DDE - Data Driven Event, HW - Hardware Installed
              ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
              MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
              MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
              e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
```



```

VRF green
(*,FF00::/8) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 412/412/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF00::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF02::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF06:1::1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 4/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A NS
  Vlan101 Flags: F NS
    Pkts: 0/0/0    Rate: 0 pps
(FC00:1:102::12,FF06:1::1) Flags: HW
  SW Forwarding: 3/0/100/0, Other: 0/0/0
  HW Forwarding: 58/0/125/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan101 Flags: F NS
    Pkts: 0/0/3    Rate: 0 pps
(FC00:2:255::1,FF06:1::1) Flags: HW
  SW Forwarding: 1/0/100/0, Other: 0/0/0
  HW Forwarding: 36/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan101 Flags: F NS
    Pkts: 0/0/1    Rate: 0 pps
(*,FF10::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF12::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF72::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF80::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF82::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0

```

```

HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FEE0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FEE2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
Leaf-01#

```

次に、VTEP 1 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```

Leaf-01# show bgp ipv6 mvpn all
BGP table version is 43, local router ID is 172.16.255.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
*>i  [5][1:1][FC00:1:102::12][FF06:1::1]/42
      172.16.255.4          0      100      0 ?
* i   172.16.255.4          0      100      0 ?
*>i  [5][1:1][FC00:2:255::1][FF06:1::1]/42
      172.16.255.6          0      100      0 ?
* i   172.16.255.6          0      100      0 ?
*>   [6][1:1][65001][FC00:2:255::255][FF06:1::1]/46
      ::                      32768 ?
*>   [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
      ::                      32768 ?
Route Distinguisher: 172.16.254.4:102
*>   [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
      ::                      32768 ?
Leaf-01#

```

次に、VTEP 1 での **show ip mroute** コマンドの出力例を示します。

```

Leaf-01# show 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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 1d01h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:49

(172.16.254.4, 239.1.1.1), 00:01:54/00:01:05, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:01:54/00:01:05

(172.16.254.6, 239.1.1.1), 00:01:56/00:01:03, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:01:56/00:01:03

(*, 224.0.1.40), 1d01h/00:02:53, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d01h/00:02:53

(*, 225.0.0.102), 1d01h/stopped, RP 172.16.255.255, flags: SJCx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:49

(172.16.254.4, 225.0.0.102), 1d01h/00:02:01, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:10

(172.16.254.6, 225.0.0.102), 1d01h/00:02:20, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:49

(*, 225.0.0.101), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.23.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:49

(172.16.254.3, 225.0.0.101), 1d01h/00:01:58, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:08
Leaf-01#
```

次に、VTEP 1 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-01# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
```

RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

```

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
    Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  1/0/114/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 13/0/127/0, Other: 2/2/0
  HW Forwarding:  7870/0/164/0, Other: 0/0/0
  Null0 Flags: A
  GigabitEthernet1/0/2 Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  2/0/172/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding:  5222/0/176/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding:  2137/0/163/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  11/0/168/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
  SW Forwarding: 4/0/150/0, Other: 0/0/0
  HW Forwarding:  518/0/168/1, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
    Pkts: 0/0/4   Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
  SW Forwarding: 1/0/150/0, Other: 0/0/0
  HW Forwarding:  498/1/168/1, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Tunnel0, VXLAN Decap Flags: F NS
Pkts: 0/0/1 Rate: 0 pps
Leaf-01#
```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4 およびIPv6 のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (182 ページ) に戻ります。

VTEP 2 の設定を確認する出力

次に、VTEP 2 での **show nve peers** コマンドの出力例を示します。

```
Leaf-02# show nve peers
Interface VNI Type Peer-IP RMAC/Num_RT s eVNI state flags UP time
nve1 50901 L3CP 172.16.254.6 0c75.bd67.ef48 50901 UP A/-/4 1d01h
nve1 50901 L3CP 172.16.254.3 10b3.d56a.8fc8 50901 UP A/-/4 1d01h
nve1 50901 L3CP 172.16.254.6 0c75.bd67.ef48 50901 UP A/M/6 1d01h
nve1 50901 L3CP 172.16.254.3 10b3.d56a.8fc8 50901 UP A/M/6 1d01h
nve1 10101 L2CP 172.16.254.3 6 10101 UP N/A 1d01h
nve1 10102 L2CP 172.16.254.6 5 10102 UP N/A 1d01h
Leaf-02#
```

次に、VTEP 2 での **show l2vpn evpn peers vxlan** コマンドの出力例を示します。

```
Leaf-02# show l2vpn evpn peers vxlan
Interface VNI Peer-IP Num routes eVNI UP time
-----
nve1 10101 172.16.254.3 6 10101 1d01h
nve1 10102 172.16.254.6 5 10102 1d01h
Leaf-02#
```

次に、VTEP 2 での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Leaf-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.4, local AS number 65001
BGP table version is 63, main routing table version 63
6 network entries using 2352 bytes of memory
8 path entries using 1280 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
17 BGP extended community entries using 2372 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7436 total bytes of memory
BGP activity 128/33 prefixes, 221/93 paths, scan interval 60 secs
6 networks peaked at 15:50:41 Aug 6 2020 UTC (21:30:56.871 ago)

Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd
172.16.255.1 4 65001 1797 1698 63 0 0 1d01h 2
172.16.255.2 4 65001 1792 1701 63 0 0 1d01h 2
Leaf-02#
```

次に、VTEP 2 での **show ip pim vrfvrf-name group-map** コマンドの出力例を示します。

```
Leaf-02# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)
```

```
FF00::/8*
  SM, RP: FC00:2:255::255
  RPF: V1901,::FFFF:172.16.254.6
  Info source: Static
  Uptime: 1d01h, Groups: 1
Leaf-02#
```

次に、VTEP 2 での **show ip routing vrf** コマンドの出力例を示します。

```
Leaf-02# show ip routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "bgp 65001", distance 200, metric 2, type internal
  Route count is 1/1, share count 0
  Routing paths:
    172.16.254.6%default, Vlan901%default
      From AC10:FF01::
        opaque_ptr 0x7F65BA333AD0
        Last updated 1d01h ago
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                               Interface
      Uptime    Expires
FF06:1::1                                     Vlan102
      1d00h      00:02:25
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
C - Connected, L - Local, I - Received Source Specific Host Report,
P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
J - Join SPT, Y - Joined MDT-data group,
y - Sending to MDT-data group
g - BGP signal originated, G - BGP Signal received,
N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
q - BGP Src-Active originated, Q - BGP Src-Active received
E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d00h/never, RP FC00:2:255::255, flags: SCJg
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.6
  Immediate Outgoing interface list:
    Vlan102, Forward, 1d00h/never

(FC00:1:102::12, FF06:1::1), 00:05:45/00:01:27, flags: SFJTgq
  Incoming interface: Vlan102
  RPF nbr: FE80::46D3:CAFF:FE28:6CC5
  Immediate Outgoing interface list:
    Vlan901, Forward, 00:05:45/never

(FC00:2:255::1, FF06:1::1), 00:05:04/00:02:07, flags: SJTgQ
  Incoming interface: Vlan901
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
RPF nbr: ::FFFF:172.16.254.6
Inherited Outgoing interface list:
  Vlan102, Forward, 1d00h/never
Leaf-02#
```

次に、VTEP 2 での **show ipv6 mfib vrf vrf-name** コマンドの出力例を示します。

```
Leaf-02# show ipv6 mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/ES Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,FF00::/8) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF00::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF02::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 9/9/0
(*,FF06:1::1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 3/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A NS
  Vlan102 Flags: F NS
    Pkts: 0/0/0   Rate: 0 pps
(FC00:1:102::12,FF06:1::1) Flags: HW
  SW Forwarding: 3/0/100/0, Other: 2/2/0
  HW Forwarding: 168/0/118/0, Other: 0/0/0
  Vlan102 Flags: A F
    Pkts: 0/0/0   Rate: 0 pps
  Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
    Pkts: 0/0/2   Rate: 0 pps
(FC00:2:255::1,FF06:1::1) Flags: HW
  SW Forwarding: 1/0/100/0, Other: 0/0/0
  HW Forwarding: 148/0/126/0, Other: 0/0/0
  Vlan901, VXLAN Decap Flags: A
  Vlan102 Flags: F NS
    Pkts: 0/0/1   Rate: 0 pps
(*,FF10::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF12::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
```



```

SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3A::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF72::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF80::/15) Flags: HW

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF82::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFE0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFE2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
Leaf-02#

```

次に、VTEP 2 での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```

Leaf-02# show bgp ipv6 mvpn all
BGP table version is 63, local router ID is 172.16.255.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
*>   [5] [1:1] [FC00:1:102::12] [FF06:1::1]/42
      ::                                32768 ?
*i   [5] [1:1] [FC00:2:255::1] [FF06:1::1]/42
      172.16.255.6                0    100    0 ?
*>i  172.16.255.6                0    100    0 ?
*>   [6] [1:1] [65001] [FC00:2:255::255] [FF06:1::1]/46
      ::                                32768 ?
*>i  [7] [1:1] [65001] [FC00:1:102::12] [FF06:1::1]/46
      172.16.255.3                0    100    0 ?

```

```
*> [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
      ::                               32768 ?
Route Distinguisher: 172.16.254.4:102
* i [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
      172.16.255.3                    0    100    0 ?
*>i      172.16.255.3                    0    100    0 ?
Leaf-02#
```

次に、VTEP 2 での **show ip mroute** コマンドの出力例を示します。

```
Leaf-02# show 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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:01:32

(172.16.254.4, 239.1.1.1), 00:05:43/00:01:46, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 00:05:43/00:02:43

(172.16.254.6, 239.1.1.1), 00:05:45/00:01:06, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:05:45/00:00:14

(*, 224.0.1.40), 1d01h/00:02:31, RP 172.16.255.255, flags: SJCL
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d01h/00:02:31

(*, 225.0.0.102), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:01:32

(172.16.254.6, 225.0.0.102), 1d01h/00:00:55, flags: JTx
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:01:32

(172.16.254.4, 225.0.0.102), 1d01h/00:01:49, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:26
(*, 225.0.0.101), 1d01h/stopped, RP 172.16.255.255, flags: SJCx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Tunnel0, Forward/Sparse, 1d01h/00:01:32
(172.16.254.3, 225.0.0.101), 1d01h/00:01:46, flags: JTx
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.2
Outgoing interface list:
  Tunnel0, Forward/Sparse, 1d01h/00:01:32
Leaf-02#
```

次に、VTEP 2 での **show ip mfib** コマンドの出力例を示します。

```
Leaf-02# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
                  e - Encap helper tunnel flag.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Loopback0 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 2/0/170/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 1/0/150/0, Other: 0/0/0
  HW Forwarding: 7870/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1/0/224/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 2/0/163/0, Other: 3/1/2
```

```

HW Forwarding: 5353/0/164/0, Other: 0/0/0
Null0 Flags: A
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/1 Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 1/0/206/0, Other: 0/0/0
HW Forwarding: 2165/0/163/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1 Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 5/0/168/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0 Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 1495/1491/4
HW Forwarding: 742/0/156/0, Other: 0/0/0
Null0 Flags: A NS
GigabitEthernet1/0/2 Flags: F
  Pkts: 0/0/1 Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 1/0/150/0, Other: 0/0/0
HW Forwarding: 1460/1/168/1, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A NS
Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1 Rate: 0 pps
Leaf-02#

```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認 (182ページ) に戻ります。

ボーダーVTEPの設定を確認する出力

次に、ボーダーVTEPでのshow nve peers コマンドの出力例を示します。

```

Border# show nve peers
Interface VNI Type Peer-IP RMAC/Num_RTs eVNI state flags UP time
nve1 50901 L3CP 172.16.254.3 10b3.d56a.8fc8 50901 UP A/-/4 1d01h
nve1 50901 L3CP 172.16.254.4 7c21.0dbd.9548 50901 UP A/-/4 1d01h
nve1 50901 L3CP 172.16.254.3 10b3.d56a.8fc8 50901 UP A/M/6 1d01h
nve1 50901 L3CP 172.16.254.4 7c21.0dbd.9548 50901 UP A/M/6 1d01h
nve1 10101 L2CP 172.16.254.3 6 10101 UP N/A 1d01h
nve1 10102 L2CP 172.16.254.4 7 10102 UP N/A 1d00h
Border#

```

次に、ボーダーVTEPでのshow l2vpn evpn peers vxlan コマンドの出力例を示します。

```

Border# show l2vpn evpn peers vxlan
Interface VNI Peer-IP Num routes eVNI UP time
-----
nve1 10101 172.16.254.3 6 10101 1d01h
nve1 10102 172.16.254.4 7 10102 1d00h
Border#

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

次に、ボーダー VTEP での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Border# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.6, local AS number 65001
BGP table version is 62, main routing table version 62
5 network entries using 1960 bytes of memory
8 path entries using 1280 bytes of memory
4/4 BGP path/bestpath attribute entries using 1248 bytes of memory
4 BGP rrinfo entries using 160 bytes of memory
1 BGP community entries using 24 bytes of memory
19 BGP extended community entries using 2682 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7354 total bytes of memory
BGP activity 122/28 prefixes, 244/122 paths, scan interval 60 secs
5 networks peaked at 15:42:39 Aug 6 2020 UTC (21:35:36.535 ago)

Neighbor          V          AS MsgRcvd MsgSent  TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.255.1      4          65001   1810   1710     62    0    0 1d01h    3
172.16.255.2      4          65001   1810   1704     62    0    0 1d01h    3
Border#
```

次に、ボーダー VTEP での **show ip pim vrf vrf-namegroup-map** コマンドの出力例を示します。

```
Border# show ip pim vrf green group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF06:1::/8*
  SM, RP: FC00:2:255::255
  RPF: V12001,FE80::A2B4:39FF:FE21:9183
  Info source: Static
  Uptime: 1d01h, Groups: 1
Border#
```

次に、ボーダー VTEP での **show ip routing vrf vrf-name** コマンドの出力例を示します。

```
Border# show ip routing vrf green FC00:2:255::255
Routing entry for FC00:2:255::255/128
  Known via "ospf 1", distance 110, metric 2, type intra area
  Redistributing via bgp 65001
  Route count is 1/1, share count 0
  Routing paths:
    FE80::A2B4:39FF:FE21:9183, Vlan2001
    From FE80::A2B4:39FF:FE21:9183
    Last updated 1d01h ago
Border#
```

次に、ボーダー VTEP での **show ipv6 mld vrf vrf-namegroups** コマンドの出力例を示します。

```
Border# show ipv6 mld vrf green groups
MLD Connected Group Membership
Group Address                               Interface
      Uptime      Expires
FF06:1::1                                     Vlan102
```

```

1d00h      00:04:02
Border#

```

次に、ボーダー VTEP での **show ipv6 mroute vrf vrf-name** コマンドの出力例を示します。

```

Border# show ipv6 mroute vrf green
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d00h/never, RP FC00:2:255::255, flags: SCG
  Incoming interface: Vlan2001
  RPF nbr: FE80::A2B4:39FF:FE21:9183
  Immediate Outgoing interface list:
    Vlan102, Null, 1d00h/never
    Vlan901, Forward, 1d00h/never

(FC00:1:102::12, FF06:1::1), 00:10:24/now, flags: STG
  Incoming interface: Vlan901
  RPF nbr: ::FFFF:172.16.254.4
  Immediate Outgoing interface list:
    Vlan2001, Forward, 00:10:24/00:03:05
  Inherited Outgoing interface list:
    Vlan102, Null, 1d00h/never

(FC00:2:255::1, FF06:1::1), 00:09:43/never, flags: STGq
  Incoming interface: Vlan2001
  RPF nbr: FE80::A2B4:39FF:FE21:9183
  Immediate Outgoing interface list:
    Vlan901, Forward, 00:09:43/never
  Inherited Outgoing interface list:
    Vlan102, Null, 1d00h/never
Border#

```

次に、ボーダー VTEP での **show ipv6 mfib vrf vrf-name** コマンドの出力例を示します。

```

Border# show ipv6 mfib vrf green
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
            ET - Data Rate Exceeds Threshold, K - Keepalive
            DDE - Data Driven Event, HW - Hardware Installed
            ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
            MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
            MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
            e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
              NS - Negate Signalling, SP - Signal Present,
              A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
              MA - MFIB Accept, A2 - Accept backup,
              RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
VRF green
(*,FF00::/8) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF00::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF02::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 9/9/0
(*,FF06:1::1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 3/3/0
  HW Forwarding:  7/0/122/0, Other: 0/0/0
Vlan2001 Flags: A
Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
  Pkts: 0/0/0   Rate: 0 pps
(FC00:1:102::12,FF06:1::1) Flags: HW
  SW Forwarding: 2/0/100/0, Other: 1/0/1
  HW Forwarding:  311/0/125/0, Other: 0/0/0
Vlan901, VXLAN Decap Flags: A
Vlan2001 Flags: F NS
  Pkts: 0/0/2   Rate: 0 pps
(FC00:2:255::1,FF06:1::1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  291/0/122/0, Other: 0/0/0
Vlan2001 Flags: A
Vlan901, VXLAN v4 Encap (50901, 239.1.1.1) Flags: F
  Pkts: 0/0/0   Rate: 0 pps
(*,FF10::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF12::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF20::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF22::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF30::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF32::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF33::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF34::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF35::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF36::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF37::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF38::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,FF39::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0

```



```
(*,FF3A::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3B::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3C::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3D::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3E::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF3F::/32) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF40::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF42::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF50::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF52::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF60::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF62::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF70::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF72::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF80::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF82::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF90::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FF92::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFA2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFB2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC0::/15) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFC2::/16) Flags:
  SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD0::/15) Flags: HW
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```

SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFD2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFE0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFE2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF0::/15) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,FFF2::/16) Flags:
SW Forwarding: 0/0/0/0, Other: 0/0/0
Border#

```

次に、ボーダー VTEP での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```

Border# show bgp ipv4 mvpn all
BGP table version is 62, local router ID is 172.16.255.6
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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 green)
*>i  [5] [1:1] [FC00:1:102::12] [FF06:1::1]/42
                172.16.255.4          0      100      0 ?
* i    [5] [1:1] [FC00:2:255::1] [FF06:1::1]/42
                ::                                32768 ?
* i    [6] [1:1] [65001] [FC00:2:255::255] [FF06:1::1]/46
                172.16.255.3          0      100      0 ?
*>i    [6] [1:1] [65001] [FC00:2:255::1] [FF06:1::1]/46
                172.16.255.3          0      100      0 ?
* i    [7] [1:1] [65001] [FC00:2:255::1] [FF06:1::1]/46
                172.16.255.3          0      100      0 ?
*>i    [7] [1:1] [65001] [FC00:2:255::1] [FF06:1::1]/46
                172.16.255.3          0      100      0 ?
Route Distinguisher: 172.16.254.4:102
*>    [7] [172.16.254.4:102] [65001] [FC00:1:102::12] [FF06:1::1]/46
                ::                                32768 ?
Border#

```

次に、ボーダー VTEP での **show ip mroute** コマンドの出力例を示します。

```

Border# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf,

```

```

    e - encap-helper tunnel flag
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:41

(172.16.254.4, 239.1.1.1), 00:10:23/00:02:45, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 00:10:23/00:01:36

(172.16.254.6, 239.1.1.1), 00:10:25/00:03:25, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 00:10:25/00:02:56

(*, 224.0.1.40), 1d01h/00:02:45, RP 172.16.255.255, flags: SJCL
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Loopback0, Forward/Sparse, 1d01h/00:02:45

(*, 225.0.0.102), 1d01h/stopped, RP 172.16.255.255, flags: SJCFx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:41

(172.16.254.4, 225.0.0.102), 1d01h/00:02:35, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:41

(172.16.254.6, 225.0.0.102), 1d01h/00:03:27, flags: FTx
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    TenGigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:02:49, A

(*, 225.0.0.101), 1d01h/stopped, RP 172.16.255.255, flags: SJCX
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:41

(172.16.254.3, 225.0.0.101), 1d01h/00:01:12, flags: JTx
  Incoming interface: TenGigabitEthernet1/0/2, RPF nbr 172.16.26.2
  Outgoing interface list:
    Tunnel0, Forward/Sparse, 1d01h/00:02:53
Border#

```

次に、ボーダー VTEP での **show ip mfib** コマンドの出力例を示します。

```

Border# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
             e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,

```

例：RP が BGP EVPN VXLAN ファブリックの外部にある場合の IPv4 および IPv6 のマルチキャストトラフィックに対して PIM-SM を使用した TRM の設定

A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
 MA - MFIB Accept, A2 - Accept backup,
 RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

```
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Loopback0 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.101) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  8/0/146/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
  SW Forwarding: 7/0/125/0, Other: 0/0/0
  HW Forwarding:  8010/0/176/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/7   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  1/0/172/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 1/0/154/0, Other: 0/0/0
  HW Forwarding:  5353/0/176/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/1   Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 11/0/167/0, Other: 7/6/1
  HW Forwarding:  2207/0/151/0, Other: 0/0/0
  Null0 Flags: A
  TenGigabitEthernet1/0/2 Flags: F
  Pkts: 0/0/10  Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  8/0/168/0, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A NS
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
  SW Forwarding: 4/0/150/0, Other: 0/0/0
  HW Forwarding:  2032/1/168/1, Other: 0/0/0
  TenGigabitEthernet1/0/2 Flags: A
  Tunnel0, VXLAN Decap Flags: F NS
  Pkts: 0/0/4   Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
  SW Forwarding: 2/0/150/0, Other: 4/4/0
```

```
HW Forwarding: 2015/1/156/1, Other: 0/0/0
Null0 Flags: A
TenGigabitEthernet1/0/2 Flags: F
Pkts: 0/0/1 Rate: 0 pps
Border#
```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（182ページ）に戻ります。

スパインスイッチ1の設定を確認するための出力

次に、スパインスイッチ1での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Spine-01# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.1, local AS number 65001
BGP table version is 61, main routing table version 61
5 network entries using 1960 bytes of memory
13 path entries using 2080 bytes of memory
3/3 BGP path/bestpath attribute entries using 912 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
16 BGP extended community entries using 2332 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7428 total bytes of memory
BGP activity 257/209 prefixes, 3003/2900 paths, scan interval 60 secs
5 networks peaked at 15:48:28 Aug 6 2020 UTC (21:38:24.468 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.2  4      65001   2190   2137    61    0    0 1d04h    5
172.16.255.3  4      65001   1700   1808    61    0    0 1d01h    3
172.16.255.4  4      65001   1706   1805    61    0    0 1d01h    3
172.16.255.6  4      65001   1713   1813    61    0    0 1d01h    2
Spine-01#
```

次に、スパインスイッチ1での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```
Spine-01# show bgp ipv6 mvpn all
BGP table version is 61, local router ID is 172.16.255.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
               x best-external, a additional-path, c RIB-compressed,
               t secondary path, L long-lived-stale,
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
* i   [5] [1:1] [FC00:1:102::12] [FF06:1::1]/42
      172.16.255.4      0    100    0 ?
*>i   172.16.255.4      0    100    0 ?
* i   [5] [1:1] [FC00:2:255::1] [FF06:1::1]/42
      172.16.255.6      0    100    0 ?
*>i   172.16.255.6      0    100    0 ?
*>i   [6] [1:1] [65001] [FC00:2:255::255] [FF06:1::1]/46
      172.16.255.3      0    100    0 ?
* i   172.16.255.3      0    100    0 ?
* i   172.16.255.4      0    100    0 ?
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
* i [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
      172.16.255.4          0    100    0 ?
* i      172.16.255.3          0    100    0 ?
*>i     172.16.255.3          0    100    0 ?
Route Distinguisher: 172.16.254.4:102
*>i [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
      172.16.255.3          0    100    0 ?
* i      172.16.255.3          0    100    0 ?
* i      172.16.255.6          0    100    0 ?
Spine-01#
```

次に、スパインスイッチ1での **show ip pim rp mapping** コマンドの出力例を示します。

```
Spine-01# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)
Spine-01#
```

次に、スパインスイッチ1での **show ip mroute** コマンドの出力例を示します。

```
Spine-01# show 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,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry,
       * - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 00:13:12/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(172.16.254.4, 239.1.1.1), 00:11:10/00:01:49, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null

(172.16.254.6, 239.1.1.1), 00:13:12/00:02:08, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(*, 224.0.1.40), 1w0d/00:02:04, RP 172.16.255.255, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback2, Forward/Sparse, 1w0d/00:02:04

(*, 225.0.0.102), 1w0d/stopped, RP 172.16.255.255, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null
```

```
(172.16.254.6, 225.0.0.102), 00:19:31/00:02:22, flags: PA
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.16.6
  Outgoing interface list: Null

(172.16.254.4, 225.0.0.102), 1d01h/00:01:52, flags: PA
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.14.4
  Outgoing interface list: Null
Spine-01#
```

次に、スパインスイッチ1での **show ip mfib** コマンドの出力例を示します。

```
Spine-01# show ip mfib
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             ET - Data Rate Exceeds Threshold, K - Keepalive
             DDE - Data Driven Event, HW - Hardware Installed
             ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
             MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
             MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
               NS - Negate Signalling, SP - Signal Present,
               A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
               MA - MFIB Accept, A2 - Accept backup,
               RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:  HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 82/82/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  Loopback2 Flags: F IC NS
  Pkts: 0/0/0   Rate: 0 pps
(*,225.0.0.102) Flags: C HW
  SW Forwarding: 1/0/206/0, Other: 279/0/279
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
(172.16.254.4,225.0.0.102) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  GigabitEthernet1/0/2 Flags: NS
(172.16.254.6,225.0.0.102) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
  GigabitEthernet1/0/4 Flags: NS
(*,232.0.0.0/8) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding:  0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
  SW Forwarding: 0/0/0/0, Other: 1/0/1
  HW Forwarding:  0/0/0/0, Other: 0/0/0
  Tunnell Flags: A
(172.16.254.4,239.1.1.1) Flags: HW
  SW Forwarding: 0/0/0/0, Other: 0/0/0
  HW Forwarding: 1224/0/168/0, Other: 0/0/0
  GigabitEthernet1/0/2 Flags: A
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A NS
Spine-01#
```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（182ページ）に戻ります。

スパインスイッチ2の設定を確認するための出力

次に、スパインスイッチ2での **show bgp ipv6 mvpn all summary** コマンドの出力例を示します。

```
Spine-02# show bgp ipv6 mvpn all summary
BGP router identifier 172.16.255.2, local AS number 65001
BGP table version is 61, main routing table version 61
5 network entries using 1960 bytes of memory
13 path entries using 2080 bytes of memory
3/3 BGP path/bestpath attribute entries using 912 bytes of memory
3 BGP rrinfo entries using 120 bytes of memory
1 BGP community entries using 24 bytes of memory
16 BGP extended community entries using 2332 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 7428 total bytes of memory
BGP activity 288/240 prefixes, 3108/3005 paths, scan interval 60 secs
5 networks peaked at 15:49:16 Aug 6 2020 UTC (21:40:40.843 ago)

Neighbor      V      AS MsgRcvd MsgSent  TblVer  InQ  OutQ  Up/Down  State/PfxRcd
172.16.255.1  4      65001  2139   2193     61    0    0 1d04h    5
172.16.255.3  4      65001  1700   1810     61    0    0 1d01h    3
172.16.255.4  4      65001  1711   1803     61    0    0 1d01h    3
172.16.255.5  4      65001    0      0        1    0    0 08:41:01 Idle
172.16.255.6  4      65001  1710   1815     61    0    0 1d01h    2
172.16.255.7  4      65001    0      0        1    0    0 08:40:29 Idle
Spine-02#
```

次に、スパインスイッチ2での **show bgp ipv6 mvpn all** コマンドの出力例を示します。

```
Spine-02# show bgp ipv6 mvpn all
BGP table version is 61, local router ID is 172.16.255.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
x best-external, a additional-path, c RIB-compressed,
t secondary path, L long-lived-stale,
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
* i  [5] [1:1] [FC00:1:102::12] [FF06:1::1] /42
      172.16.255.4      0    100    0 ?
*>i      172.16.255.4      0    100    0 ?
* i  [5] [1:1] [FC00:2:255::1] [FF06:1::1] /42
      172.16.255.6      0    100    0 ?
*>i      172.16.255.6      0    100    0 ?
*>i  [6] [1:1] [65001] [FC00:2:255::255] [FF06:1::1] /46
      172.16.255.3      0    100    0 ?
```



```
* i          172.16.255.3          0    100    0 ?
* i          172.16.255.4          0    100    0 ?
* i  [7][1:1][65001][FC00:2:255::1][FF06:1::1]/46
          172.16.255.4          0    100    0 ?
* i          172.16.255.3          0    100    0 ?
*>i         172.16.255.3          0    100    0 ?
Route Distinguisher: 172.16.254.4:102
*>i  [7][172.16.254.4:102][65001][FC00:1:102::12][FF06:1::1]/46
          172.16.255.3          0    100    0 ?
* i          172.16.255.3          0    100    0 ?
* i          172.16.255.6          0    100    0 ?
Spine-02#
```

次に、スパインスイッチ2での **show ip pim rp mapping** コマンドの出力例を示します。

```
Spine-02# show ip pim rp mapping
PIM Group-to-RP Mappings

Group(s): 224.0.0.0/4, Static
          RP: 172.16.255.255 (?)
Spine-02#
```

次に、スパインスイッチ2での **show ip mroute** コマンドの出力例を示します。

```
Spine-02# show 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,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 3d08h/00:03:24, RP 172.16.255.255, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:24
    GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:06
    GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:02

(172.16.254.4, 239.1.1.1), 00:15:27/00:02:45, flags: T
  Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
  Outgoing interface list:
    GigabitEthernet1/0/4, Forward/Sparse, 00:15:27/00:03:02
    GigabitEthernet1/0/1, Forward/Sparse, 00:15:27/00:03:06

(172.16.254.6, 239.1.1.1), 00:15:29/00:02:38, flags: MT
  Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
  Outgoing interface list:
    GigabitEthernet1/0/1, Forward/Sparse, 00:15:29/00:03:06
    GigabitEthernet1/0/2, Forward/Sparse, 00:15:29/00:03:24
```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
(* , 224.0.1.40), 1w0d/00:03:27, RP 172.16.255.255, flags: SJCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:02:31
  GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:27
  GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:08
  Loopback2, Forward/Sparse, 1w0d/00:02:17

(* , 225.0.0.102), 1w0d/00:03:21, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:02
  GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:02:50
  GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:21

(172.16.254.4, 225.0.0.102), 1d01h/00:01:55, flags: MT
Incoming interface: GigabitEthernet1/0/2, RPF nbr 172.16.24.4
Outgoing interface list:
  GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:21
  GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:02

(172.16.254.6, 225.0.0.102), 1d01h/00:02:03, flags: MT
Incoming interface: GigabitEthernet1/0/4, RPF nbr 172.16.26.6
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:02
  GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:13

(* , 225.0.0.101), 3d08h/00:03:29, RP 172.16.255.255, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:05
  GigabitEthernet1/0/1, Forward/Sparse, 1d01h/00:03:07
  GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:29

(172.16.254.3, 225.0.0.101), 1d01h/00:02:39, flags: TA
Incoming interface: GigabitEthernet1/0/1, RPF nbr 172.16.23.3
Outgoing interface list:
  GigabitEthernet1/0/2, Forward/Sparse, 1d01h/00:03:05
  GigabitEthernet1/0/4, Forward/Sparse, 1d01h/00:03:29
Spine-02#
```

次に、スパインスイッチ2での **show ip mfib** コマンドの出力例を示します。

```
Spine-02# show ip mfib
Entry Flags:      C - Directly Connected, S - Signal, IA - Inherit A flag,
                  ET - Data Rate Exceeds Threshold, K - Keepalive
                  DDE - Data Driven Event, HW - Hardware Installed
                  ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
                  MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
                  MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags:  IC - Internal Copy, NP - Not platform switched,
                  NS - Negate Signalling, SP - Signal Present,
                  A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                  MA - MFIB Accept, A2 - Accept backup,
                  RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   HW Pkt Count/FS Pkt Count/PS Pkt Count   Egress Rate in pps
Default
(*,224.0.0.0/4) Flags: C HW
```

```

SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,224.0.1.40) Flags: C HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
Loopback2 Flags: F IC NS
Pkts: 0/0/0 Rate: 0 pps
(*,225.0.0.101) Flags: C HW
SW Forwarding: 9/0/112/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/2 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/2 Rate: 0 pps
(172.16.254.3,225.0.0.101) Flags: HW
SW Forwarding: 4/0/132/0, Other: 0/0/0
HW Forwarding: 8067/0/176/0, Other: 0/0/0
GigabitEthernet1/0/1 Flags: A
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/4 Rate: 0 pps
(*,225.0.0.102) Flags: C HW
SW Forwarding: 27/0/101/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.4,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 5404/0/176/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(172.16.254.6,225.0.0.102) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 2214/0/163/0, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A NS
GigabitEthernet1/0/1 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
Pkts: 0/0/0 Rate: 0 pps
(*,232.0.0.0/8) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
(*,239.1.1.1) Flags: C HW
SW Forwarding: 9/0/150/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0

```

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

```
Tunnell Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/3   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/3   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/3   Rate: 0 pps
(172.16.254.4,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 2629/1/168/1, Other: 0/0/0
GigabitEthernet1/0/2 Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/4 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
(172.16.254.6,239.1.1.1) Flags: HW
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 2607/1/168/1, Other: 0/0/0
GigabitEthernet1/0/4 Flags: A
GigabitEthernet1/0/1 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
GigabitEthernet1/0/2 Flags: F NS
  Pkts: 0/0/0   Rate: 0 pps
Spine-02#
```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（182ページ）に戻ります。

ルータ3（BGP EVPN VXLAN ファブリックの外部にあるRP）の設定を確認する出力

次に、ルータ3での **show ip pim group-map** コマンドの出力例を示します。

```
R3# show ipv6 pim group-map ff06:1::1
IP PIM Group Mapping Table
(* indicates group mappings being used)

FF00::/8*
  SM, RP: FC00:2:255::255
  RPF: Tu4,FC00:2:255::255 (us)
  Info source: Static
  Uptime: 1d04h, Groups: 1
R3#
```

次に、ルータ3での **show ipv6 mroute** コマンドの出力例を示します。

```
R3# show ipv6 mroute
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT, Y - Joined MDT-data group,
       y - Sending to MDT-data group
       g - BGP signal originated, G - BGP Signal received,
       N - BGP Shared-Tree Prune received, n - BGP C-Mroute suppressed,
       q - BGP Src-Active originated, Q - BGP Src-Active received
       E - Extranet
Timers: Uptime/Expires
Interface state: Interface, State

(*, FF06:1::1), 1d04h/00:03:12, RP FC00:2:255::255, flags: S
  Incoming interface: Tunnel4
```

```

RPF nbr: FC00:2:255::255
Immediate Outgoing interface list:
  TenGigabitEthernet0/0/1, Forward, 1d04h/00:03:12
  TenGigabitEthernet0/0/0, Forward, 1d01h/00:02:45

(FC00:1:102::12, FF06:1::1), 00:18:43/00:03:12, RP FC00:2:255::255, flags: SPR
Incoming interface: Tunnel4
RPF nbr: FC00:2:255::255
Immediate Outgoing interface list:
  TenGigabitEthernet0/0/0, Null, 00:18:43/00:02:45
  TenGigabitEthernet0/0/1, Null, 00:18:43/00:03:12

(FC00:1:102::12, FF06:1::1), 00:18:45/00:03:12, flags: S
Incoming interface: TenGigabitEthernet0/0/0
RPF nbr: FE80::A2B4:39FF:FE21:9181
Inherited Outgoing interface list:
  TenGigabitEthernet0/0/1, Forward, 1d04h/00:03:12

(FC00:2:255::1, FF06:1::1), 00:18:08/00:02:55, RP FC00:2:255::255, flags: SPR
Incoming interface: Tunnel4
RPF nbr: FC00:2:255::255
Immediate Outgoing interface list:
  TenGigabitEthernet0/0/0, Null, 00:18:08/00:02:45
  TenGigabitEthernet0/0/1, Null, 00:18:04/00:03:12

(FC00:2:255::1, FF06:1::1), 00:18:06/00:02:55, flags: S
Incoming interface: TenGigabitEthernet0/0/0
RPF nbr: FE80::A2B4:39FF:FE21:9181
Inherited Outgoing interface list:
  TenGigabitEthernet0/0/1, Forward, 1d04h/00:03:12
R3#

```

RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの確認（182ページ）に戻ります。

例：RPがBGP EVPN VXLAN ファブリックの外部にある場合のIPv4およびIPv6のマルチキャストトラフィックに対してPIM-SMを使用したTRMの設定

翻訳について

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