

PPVPN WG
Internet Draft

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BGP/MPLS VPN Policy Information Base

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Abstract

This document describes a Policy Information Base (PIB) for a device implementing the BGP/MPLS VPN [[2547bis](#)] Architecture. The Provisioning Classes defined here provide policy control of resources implementing the BGP/MPLS VPN Architecture. These Provisioning Classes can be used with other non BGP/MPLS VPN Provisioning Classes (defined in other PIBs) to provide for a comprehensive policy controlled mapping of service requirements to device resource capability and usage.

Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

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1. Glossary

PRC Provisioning Class. A type of policy data.
PRI Provisioning Instance. An instance of a PRC.
PIB Policy Information Base. The database of policy information.
PDP Policy Decision Point. See [RAP-FRWK].
PEP Policy Enforcement Point. See [RAP-FRWK].
PRID Provisioning Instance Identifier. Uniquely identifies an instance of a PRC.
PE Provider Edge. See [2547bis].
CE Customer Edge. See [2547bis].
RR Route Reflector. See [2547bis].
VRF Virtual Routing and Forwarding. See [2547bis].
ORF Outbound Route Filtering. See [2547bis].

2. Introduction

[SPPI] describes a structure for specifying policy information that can then be transmitted to a network device for the purpose of configuring policy at that device. The model underlying this structure is one of well-defined provisioning classes and instances of these classes residing in a virtual information store called the Policy Information Base (PIB).

This document specifies a set of provisioning classes specifically for configuring BGP/MPLS VPN services in the service provider devices (PE routers).

One way to provision policy is by means of the COPS protocol [COPS] with the extensions for provisioning [COPS-PR]. This protocol supports multiple clients, each of which may provision policy for a specific policy domain such as VPNs. The PRCs defined in this BGP/MPLS VPN PIB are intended for use by the COPS-PR PPVPN client-type [COPS-PPVPN]. Furthermore, these PRCs are in addition to any other PIBs that may be defined for the PPVPN client type in the future, as well as the PRCs defined in the Framework PIB [FR-PIB] and the Feedback Framework PIB [FEED-PIB].

The COPS-PR protocol offers significant advantages when dealing with dynamic configuration and when compared to traditional management solutions. Moreover, dynamic VPN resource assignment is crucial to cope with the frequent changes requests from customer's (e.g., sites joining or leaving a VPN), as well as to achieve scalability. The PEs should be able to dynamically assign the VPN resources. This capability is especially important for temporary access VPN services.

3. Relationship to the MPLS VPN MIB

The present version of the BGP/MPLS VPN PIB has been designed to be as close as possible to the MPLS VPN MIB [[MPLS-VPN-MIB](#)] for consistency purposes.

However, in order to take advantage of the specifics of SPPI and COPS-PR in general, the BGP/MPLS VPN PIB has its own structure and data organization.

4. Assumptions and Prerequisites

It is assumed that certain things are configured and operational in order for the tables and objects described in this PIB to work correctly. These things are outlined below:

. Customer Visible Routing:

Routing protocols running on the customer interface (between PE routers and CE devices) must be configurable per VRF. To this end, the service provider may use any of the management solutions such as SNMP with the routing protocols MIBs.

. Routing across the SP backbone:

The MP-iBGP mechanisms specific to BGP/MPLS VPNs are assumed to be configured and operational in order for PEs to exchange their routes. To this end, the service provider may use any of the management solutions such as SNMP with the BGP4 specific MIB, namely [[BGP4-MIB](#)].

Then the BGP/MPLS mechanisms are in charge of dynamically distributing these routes between sites according to the VPN policies contained in the present PIB.

. VPN Tunneling and QoS:

MPLS in general, must be configured and operational. To this end, the service provider may use any of the management solutions such as SNMP with the MPLS specific MIBs, namely [[LSR-MIB](#)], [[FTN-MIB](#)] or [[TE-MIB](#)].

The LSPs establishment between PEs within the service provider network is out of the scope of this document. It is the service provider's responsibility to establish internal LSPs in order to connect its PEs or RRs together. The LSPs can be either best-effort or QoS-aware, traffic engineered or not, etc.

In the case of hierarchical and recursive VPNs, the LSPs establishment on the PE-CE interface is also out of the scope of this document.

This requires coordination of identifiers of tunnels, hierarchical tunnels, VPNs, and any associated service information, for example, a QoS service. This is an implementation concern.

. Underlying infrastructure:

The configuration of a VPN must be coordinated with the configuration of the underlying infrastructure, including Layer 1 and 2 networks interconnecting components of a PPVPN. This is out of the scope of this document.

5. Operational Overview

5.1 Features List

BGP/MPLS VPN management supports configuration of intranet and extranet membership. COPS-PR enables VPN service creation, configuration, monitoring and deletion. It supports the 'VPN join' and 'VPN prune' operations dynamically.

BGP/MPLS VPN configuration using COPS-PR enables dynamic provisioning of resources associated with VPN services. For example, the number and size of VRF instances is provisionable.

The PIB supports BGP/MPLS VPN service as Enterprise VPN, Carrier's Carrier VPN (a.k.a. hierarchical VPNs), or Inter/Multi-provider Backbone VPN (a.k.a. recursive VPNs).

The PIB supports the maintenance and troubleshooting of BGP/MPLS VPNs.

The PIB supports BGP/MPLS VPNs that are configured on a particular physical interface or sub-interface if the interface can be divided (e.g. Frame Relay, ATM, or Ethernet VLAN) by the router.

COPS-PR must be supported by PE routers and the present PIB shall be used to configure and maintain one or more VPN Routing and Forwarding Tables (VRFs).

The BGP/MPLS VPN PIB enables the monitoring of some specific parameters for usage feedback purposes.

5.2 Roles usage with the 2547bis PIB

According to [[FR-PIB](#)], roles provide a way to bind policy to interfaces without having to explicitly identify interfaces in a consistent manner across all network devices. That is, roles provide

a level of indirection to the application of a set of policies to specific interfaces. This separates the policy definition from device implementation specific interface identification. Furthermore, if the same policy is being applied to several interfaces, that policy need be pushed to the device only once, rather than once per interface, as long as the interfaces are configured with the same role combination.

When using the BGP/MPLS VPN PIB, the manager SHOULD set the roles according to interfaces VPN membership. The role combination of a customer interface must correspond to the VPNs it belongs to.

Hence, the PEP interprets this information and connect interfaces to VRFs accordingly. But such an interpretation is an implementation concern, hence it is out of the scope of the present document.

6. PIB overview

This PIB is structured based on the need to configure the VRFs realizing a VPN among the different PE routers, and the parameterization of these VRFs.

In addition, the PIB includes tables describing the capabilities and limitations of the device using a general extensible framework [FR-PIB]. These tables are reported to the PDP and assist the PDP with the configuration of VRFs that can be instantiated by the device.

Finally, this PIB offers feedback tables in order for the PEP to monitor, record and report specific information. These tables are reported periodically to the PDP based on selection criteria set by the PDP itself. This feedback mechanism follows the feedback extensible framework [FEED-FRWK].

The 3 groups are summarized below in this section.

6.1 Capabilities Group

This group consists of PRCs to indicate to the PDP the types of interface supported on the PEP in terms of their BGP/MPLS VPN capabilities (MPLS support, interface type with respect to the BGP/MPLS VPN mechanisms) and PRCs to indicate the device routing capabilities. This group describes capabilities in terms of the types of interfaces and general routing capabilities of the device. The framework PIB [FR-PIB] provides a general extensible framework for defining the capabilities and limitations of the elements listed above. The capability tables allow intelligent configuration of the elements by a PDP.

. Routing Capabilities:

This table represents routing capabilities of the device (PE) in terms of protocol support, maximum number of routes and maximum number of VRFs in the PE. The configuration of VRFs in the PE must be according to these values.

. Interfaces Capabilities:

This table represents PE customer interfaces capabilities essentially in terms of MPLS support. An interface can either support MPLS, MPLS TE tunnels or even not support MPLS at all.

6.2 Policy Group

This group contains configuration of the functional elements that comprise the BGP/MPLS VPN route distribution policy that applies to a device. This group contains VRFs, Route Targets, interfaces and ORF peers. This group takes configuration in terms of interface types and role combinations [[FR-PIB](#)]; it does not deal with individual interfaces on the device.

. VRF Table:

This table specifies BGP/MPLS VPN VRF Table associated information. Entries in this table define VRF routing instances associated with BGP/MPLS VPN interfaces or sub-interfaces. A specific Route Distinguisher is affected to each VRF in each PE. The whole pool of RDs is managed by the PDP.

. Route Target Table:

This table contains the objects necessary to configure and monitor route targets for a particular VRF. According to BGP/MPLS VPN framework [[2547bis](#)], the configuration of import and export route targets realize topological route distribution policies and, as a consequence, the so-called VPNs.

. Interface Table:

This table contains configuration information related to customer interfaces participating in BGP/MPLS VPNs. This table takes configuration in terms of interface index, referencing the Role Combination rows [[FR-PIB](#)].

. Outbound Route Filtering Peer Table:

Outbound Route Filtering resolve a scalability issue of BGP/MPLS VPN mechanism, they enables a PE to know among all the BGP peers which PE might exchange VPN membership and routing information with. This is a network management level information, based on backbone topological information. [[BGP-ORF](#)] offers a distributed way to deal with ORFs and the ORF table here offers a centralized way to build ORFs.

This class contains the actual BGP peers of the device among all the provider PEs. Based on the information contained in this table, the PE implementation can build BGP ORFs. In case the PE routers uses BGP to exchange ORF capabilities [[BGP-ORE](#)], this table should be ignored and each PE router is a potential BGP peer.

6.3 FeedBack Group

According to the framework of COPS-PR policy usage feedback [[FEED-FRWK](#)], there are three basic types of policy used to define what the PEP is to monitor, record and report. These are the selection criteria policy, the usage policy and the feedback report linkage policy.

The selection criteria policy is installed by the PDP. It defines the conditions used by the PEP to monitor and record a usage policy. The selection criteria policy may only be used for defining usage feedback selection criteria.

The usage policy defines what attributes are monitored and recorded by the PEP. The usage policies specify counts related to a specific action such as routes being added in a VRF. The PDP decides which PRC(s) best suit(s) its requirements. The PEP may support multiple usage feedback PRCs. The PDP then decides which PRC to associate with a particular selection criterion.

A usage feedback policy and selection policy are tightly associated with one another. A third policy, the `frwkFeedbackLinkTable`, is used to associate, or provide a linkage for the selection and usage policies. The `frwkFeedbackLinkTable` [[FEED-PIB](#)] also specifies when to report the usage feedback. The `frwkFeedbackLinkTable` entry permits the same selection criteria instance to be re-used for various usage feedback policies. The `frwkFeedbackLinkTable` contains the value of the selection criteria instance as well as contains the value of the usage feedback PRC.

The PDP is not aware of the instance identifier of the usage feedback policy when installing the selection criteria and feedback linkage policies. The usage feedback policy is instantiated on the PEP by the installation of a feedback report linkage and the PEP designates the instance identifier. The usage feedback policy class always contains an attribute of type `ReferenceId` that contains the instance value of the associated `frwkFeedbackLinkTable` instance installed by the PDP.

. Usage Tables:

Route Count: This table contain counters of routes hold by a VRF. The aim of this table is to trigger alarms when the maximum number of routes for a given VRF is nearly exceeded.

Label Count: This table contain counters of labels illegally received by a VRF. It is used in the case of interprovider VPNs for PE routers to notify the management system that a given VRF receives packets with non-affected labels for interdomain routes.

. Threshold Table:
This table contains the thresholds which triggers a report of the counters of either routes or labels.

. Selection Table:
In the present PIB, this class identifies a VRF to collect usage information from.

7. PIB Usage Example

Below is an example of a fulfilled BGP/MPLS VPN PIB. The example given in this section aims at realizing the following configuration in a PE router:

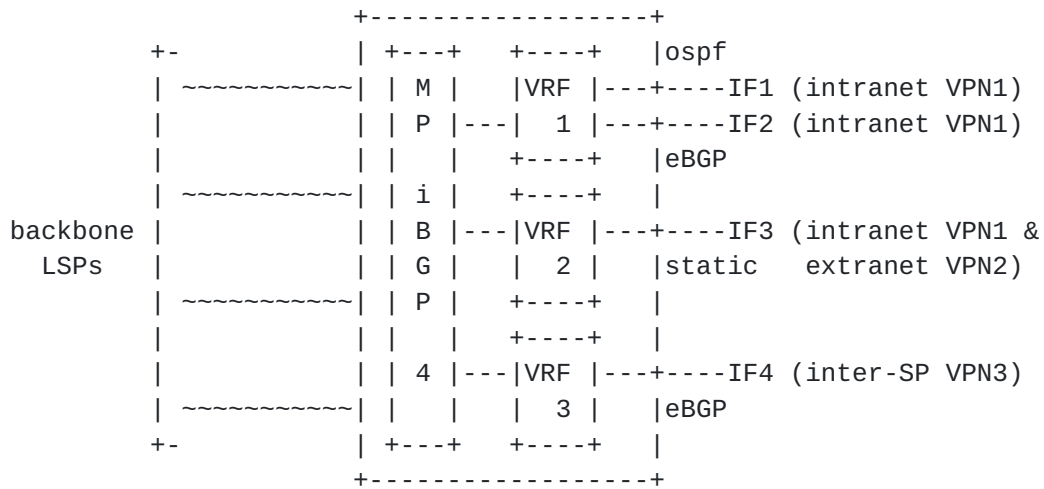


Figure 1. PE router example configuration

-- Local settings:

The following tables are BGP/MPLS VPN specific. They give an example of the routing and interface capabilities for a particular device (PE). These information are sent to the PDP mainly at the beginning of the session.


```
ppvnp2547RoutingCapsTable
{
  Prid=1, DistProtocol=eBGP+OSPF, MaxRoutes=500.000, MaxVrfs=500,
  BgpOrf = False;
}
```

```
ppvnp2547IfCapsTable
{
  Prid=1, TunnelSupport=mplsTunnel;
  Prid=2, TunnelSupport=mpls;
  Prid=3, TunnelSupport=none;
}
```

-- Framework PIB:

The following tables are defined in the generic framework PIB [FR-PIB]. The PRIs are set by the PDP and sent to the PEP for consistent later configuration.

The framework Capability Set table defines the different interface types in terms of the BGP/MPLS VPN capabilities.

```
frwkIfCapSetTable
{
  Prid=1, Name="MPLS", Capability=ppvnp2547IfCaps.2;
  Prid=2, Name="NONE", Capability=ppvnp2547IfCaps.3;
  Prid=3, Name="MPLS", Capability=ppvnp2547IfCaps.1;
}
```

The framework Role Combination table informs on which interface type each interface belongs to and also affect roles to each interface. The role affected to each interface SHOULD correspond to the VPN membership, as shown in the example bellow:

```
frwkIfRoleComboTable
{
  Prid=1, Roles=VPN1, CapSetName="MPLS", IfIndex=1;
  Prid=2, Roles=VPN1, CapSetName="NONE", IfIndex=2;
  Prid=3, Roles=VPN1+VPN2, CapSetName="MPLS", IfIndex=3;
  Prid=4, Roles=VPN3, CapSetName="MPLS", IfIndex=4; }
}
```

Do note that two interfaces (IF1 & IF2), corresponding to two distinct sites can belong to the same VPN and be connected to two distinct VRF.

-- BGP/MPLS VPN PIB:

The following tables are also BGP/MPLS VPN specific and realize routes distribution policies between sites. For further details about each PRCs, read the BGP/MPLS VPN PIB definition in the next section.

```
ppvnp2547VrfTable{
  Prid=1, Roles=VPN1, VrfId=1,
    Descr="Intranet", RD=XX, MaxRoutes=1000;
  Prid=2, Roles=VPN1+VPN2, VrfId=2,
    Descr="Extranet", RD=YY, MaxRoutes=2000;
  Prid=3, Roles=VPN3, VrfId=3,
    Descr="Carrier's Carrier", RD=ZZ, MaxRoutes=500;
}
```

Do note that the roles enable to link an interface or a set of interfaces, according to the VPN membership information.

```
ppvnp2547RouteTargetTable{
  Prid=1, Type=both , VrfId=1, RT="VPN1",
    Decsr="CUG VPN1";
  Prid=2, Type=both , VrfId=2, RT="VPN1",
    Decsr="CUG VPN1";
  Prid=3, Type=import, VrfId=2, RT="VPN2-Hub",
    Descr="Hub Site VPN2";
  Prid=4, Type=both, VrfId=3, RT="VPN3",
    Descr="CC CUG VPN3";
}
```

```
ppvnp2547IfTable{
  Prid=1, IfIndex=1, EdgeType=customerEdge, VpnClassif=enterprise,
    RouteDistProtocol="OSPF";
  Prid=2, IfIndex=2, EdgeType=customerEdge, VpnClassif=enterprise,
    RouteDistProtocol="eBGP";
  Prid=3, IfIndex=3, EdgeType=customerEdge, VpnClassif=enterprise,
    RouteDistProtocol="none";
  Prid=4, IfIndex=4, EdgeType=providerEdge, VpnClassif=cc,
    RouteDistProtocol="eBGP";
}
```

```
ppvnp2547OrfPeerTable{
  Prid=1, Role=PE, AddrType=Ipv4, Addr=192.123.122.1;
  Prid=2, Role=PE, AddrType=Ipv4, Addr=192.123.145.5;
  Prid=3, Role=RR, AddrType=Ipv4, Addr=192.123.12.34;
  Prid=4, Role=PE, AddrType=Ipv4, Addr=192.156.78.25;
  Prid=5, Role=PE, AddrType=Ipv4, Addr=192.123.9.125;
}
```


The following table is defined in the generic feedback framework PIB [FEED-PIB]. These capabilities information are sent to the PDP mainly at the beginning of the session.

```
frwkFeedbackSelUsageComboCapsTable{
  Id=1, Selection=ppvnp2547Selection,
      Usage=ppvnp2547RouteCountUsage,
      Threshold=ppvnp2547Threshold;
  Id=2, Selection=ppvnp2547Selection,
      Usage=ppvnp2547LabelCountUsage,
      Threshold=ppvnp2547Threshold;
}
```

The following tables are BGP/MPLS VPN specific. The PRIs are set by the PDP and sent to the PEP for periodic reporting.

```
ppvnp2547SelectionTable{
  Prid=1, Vrf=ppvnp2547Vrf.1;
  Prid=2, Vrf=ppvnp2547Vrf.3;
}
```

```
ppvnp2547ThresholdTable{
  Prid=1, Thresh=10.000;
}
```

The following table is defined in the generic feedback framework PIB [FEED-PIB]. The PRIs are set by the PDP and sent to the PEP for periodic reporting.

```
frwkFeedbackLinkTable{
  Id=1, Sel=ppvnp2547Selection.1, Usage=ppvnp2547RouteCountUsage,
      Interval=10, Threshold=ppvnp2547Treshold.1, Flags=threshold;
  Id=2, Sel=ppvnp2547Selection.2, Usage=ppvnp2547LabelCountUsage,
      Interval=20, Threshold=NULL, Flags=changeOnly;
}
```

8. BGP/MPLS VPN PIB Definition

8.1 The BGP/MPLS VPN PIB

```
PPVPN-PIB PIB-DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
  Unsigned32, Integer32, MODULE-IDENTITY, MODULE-COMPLIANCE,
  OBJECT-TYPE, OBJECT-GROUP, pib, TEXTUAL-CONVENTION
```

```
    FROM COPS-PR-SPPI
```

```
  InstanceId, TagId, TagReferenceId, ReferenceId
```


FROM COPS-PR-SPPI-TC
DisplayString
FROM SNMPv2-SMI
TruthValue
FROM SNMPv2-TC
RoleCombination
FROM FRAMEWORK-TC-PIB
InetAddress, InetAddressType
FROM INET-ADDRESS-MIB;

ppvpn2547PolicyPib MODULE-IDENTITY
SUBJECT-CATEGORIES { ppvpn(tbd) } -- PPVPN COPS Client Type
-- to be assigned by IANA

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DESCRIPTION

"The PIB module containing a set of provisioning classes that describe provider provisioned virtual private networks (PPVPN) policies for BGP/MPLS VPN. It includes general classes that may be extended by other PIB specifications as well as a set of PIB classes related to PPVPNs."

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DESCRIPTION

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REVISION "200203081800Z"

DESCRIPTION

"Initial version, published as [draft-yacine-ppvpn-2547-pib-00.txt](#)."

::= { pib xxx } -- xxx to be assigned by IANA

-- BGP/MPLS VPN specific Textual Conventions.

```
Ppvpn2547RouteDistinguisher ::= TEXTUAL-CONVENTION
  STATUS          current
  DESCRIPTION
    "Syntax for a route distinguisher."
  SYNTAX  OCTET STRING(SIZE (0..256))
```

```
Ppvpn2547RouteTarget ::= TEXTUAL-CONVENTION
  STATUS          current
  DESCRIPTION
    "Syntax for a route target."
  SYNTAX  OCTET STRING(SIZE (0..256))
```

-- BGP/MPLS VPN PIB module

```
ppvpn2547CapabilityClasses
  OBJECT IDENTIFIER ::= { ppvpn2547PolicyPib 1 }
ppvpn2547PolicyClasses
  OBJECT IDENTIFIER ::= { ppvpn2547PolicyPib 2 }
ppvpn2547FeedbackClasses
  OBJECT IDENTIFIER ::= { ppvpn2547PolicyPib 3 }
ppvpn2547PibConformance
  OBJECT IDENTIFIER ::= { ppvpn2547PolicyPib 4 }
```

-- Capabilities Classes

--

-- BGP/MPLS VPN PE Routing Capabilities

--

```
ppvpn2547RoutingCapsTable OBJECT-TYPE
  SYNTAX          SEQUENCE OF Ppvpn2547RoutingCapsEntry
  PIB-ACCESS      notify
  STATUS          current
  DESCRIPTION
    "This class represents routing capabilities of a device
    (PE)."
```

```
 ::= { ppvpn2547CapabilityClasses 1 }
```

```
ppvpn2547RoutingCapsEntry OBJECT-TYPE
  SYNTAX          Ppvpn2547RoutingCapsEntry
  STATUS          current
  DESCRIPTION
    "An instance of the ppvpn2547RoutingCaps class."
```

```
 PIB-INDEX { ppvpn2547RoutingCapsPrid }
 ::= { ppvpn2547RoutingCapsTable 1 }
```



```
ppvnp2547RoutingCapsEntry ::= SEQUENCE {
    ppvnp2547RoutingCapsPrid      InstanceId,
    ppvnp2547RoutingCapsDistProtocol BITS,
    ppvnp2547RoutingCapsMaxRoutes unsigned32,
    ppvnp2547RoutingCapsMaxVrfs  unsigned32,
    ppvnp2547RoutingCapsBgpOrf   TruthValue
}
```

```
ppvnp2547RoutingCapsPrid OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
        instance of the class."
    ::= { ppvnp2547RoutingCapsEntry 1 }
```

```
ppvnp2547RoutingCapsDistProtocol OBJECT-TYPE
    SYNTAX      BITS { static (0),
                      ebgp (1),
                      ospf (2),
                      rip (3),
                      isis (4)
    }
    STATUS      current
    DESCRIPTION
        "Denotes the route distribution protocol supported by the
        PE across the PE-CE links. Note that more than one
        routing protocol may be enabled at the same time."
    ::= { ppvnp2547RoutingCapsEntry 2 }
```

```
ppvnp2547RoutingCapsMaxRoutes OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Denotes maximum number of routes which this PE is
        able to hold."
    ::= { ppvnp2547RoutingCapsEntry 3 }
```

```
ppvnp2547RoutingCapsMaxVrfs OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Denotes maximum number of VRF which this PE is
        able to hold."
    ::= { ppvnp2547RoutingCapsEntry 4 }
```

```
ppvnp2547RoutingCapsBgpOrf OBJECT-TYPE
```

SYNTAX

TruthValue

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```
STATUS          current
DESCRIPTION
  "Denotes if the PEP supports Cooperative Route Filtering
  Capability for BGP [BGP-ORF]."
```

::= { ppvnp2547RoutingCapsEntry 5 }

--

-- PE Interface Capabilities

--

ppvnp2547IfCapsTable OBJECT-TYPE

```
SYNTAX          SEQUENCE OF Ppvnp2547IfCapsEntry
PIB-ACCESS      notify
STATUS          current
DESCRIPTION
  " This class represents interfaces capabilities of a device
  (PE) in terms of MPLS support."
```

::= { ppvnp2547CapabilityClasses 2 }

ppvnp2547IfCapsEntry OBJECT-TYPE

```
SYNTAX          Ppvnp2547IfCapsEntry
STATUS          current
DESCRIPTION
  "An instance of the ppvnp2547IfCaps class."
```

PIB-INDEX { ppvnp2547IfCapsPrid }

::= { ppvnp2547IfCapsTable 1 }

ppvnp2547IfCapsEntry ::= SEQUENCE {

```
    ppvnp2547IfCapsPrid      InstanceId,
    ppvnp2547IfCapsTunnelSupport  INTEGER,
```

}

ppvnp2547IfCapsPrid OBJECT-TYPE

```
SYNTAX          InstanceId
STATUS          current
DESCRIPTION
  "An arbitrary integer index that uniquely identifies an
  instance of the class."
```

::= { ppvnp2547IfCapsEntry 1 }

ppvnp2547IfCapsTunnelSupport OBJECT-TYPE

```
SYNTAX          INTEGER { none      (0),
                          mpls      (1),
                          mplsTunnel (2),
                          ipsec     (3),
                          l2tp      (4),
                          ppp       (5),
```

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```

frDlci      (7),
gre         (8),
vLan       (9),
other       (10)
}          STATUS      current
DESCRIPTION
  " Denotes the interface type in accordance with [IFMIB]
  which states that the interfaces tables contains
  information on the managed resource's interfaces and
  each sub-layer bellow the internetwork layer interface
  is considered as an interface."
 ::= { ppvnp2547IfCapsEntry 2 }

-- Policy Classes
--
-- BGP/MPLS VPN VRF Table
--

ppvnp2547VrfTable OBJECT-TYPE
  SYNTAX      SEQUENCE OF Ppvnp2547VrfEntry
  PIB-ACCESS  install
  STATUS      current
  DESCRIPTION
    "This class specifies BGP/MPLS VPN VRF Table associated
    information. Entries in this table define VRF instances
    associated with MPLS/VPN interfaces. Note that multiple
    interfaces can belong to the same VRF instance."
  ::= { ppvnp2547PolicyClasses 1 }

ppvnp2547VrfEntry OBJECT-TYPE
  SYNTAX      Ppvnp2547VrfEntry
  STATUS      current
  DESCRIPTION
    "An entry in this table is created by the provider for
    every VRF capable of supporting MPLS/BGP VPN."
  PIB-INDEX  { ppvnp2547VrfPrid }
  UNIQUENESS { ppvnp2547VrfId,
                ppvnp2547VrfRoles,
                ppvnp2547VrfRD }
  ::= { ppvnp2547VrfTable 1 }

ppvnp2547VrfEntry ::= SEQUENCE {
  ppvnp2547VrfPrid      InstanceId,
  ppvnp2547VrfVpnCombo  RoleCombination,
  ppvnp2547VrfId        TagReferenceId,
  ppvnp2547VrfDescription SnmpAdminString,
```


ppvpn2547VrfRD

Ppvpn2547RouteDistinguisher,

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```
    ppvpn2547VrfMaxRoutes    Unsigned32
}

ppvpn2547VrfPrid OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
        instance of the class."
    ::= { ppvpn2547VrfEntry 1 }

ppvpn2547VrfVpnCombo OBJECT-TYPE
    SYNTAX      RoleCombination
    STATUS      current
    DESCRIPTION
        "The interfaces to which the VRF is attached to,
        specified in terms of roles. There must exist an entry
        in the frwkIfRoleComboTable [FR-PIB] specifying
        this role combination, together with the interface
        capability set specified by ppvpn2547IfName, prior to
        association with an instance of this class."
    ::= { ppvpn2547VrfEntry 2 }

ppvpn2547VrfId OBJECT-TYPE
    SYNTAX      TagReferenceId
    PIB-TAG { ppvpn2547RouteTargetVrfId }
    STATUS      current
    DESCRIPTION
        "Identifies a VRF instance."
    ::= { ppvpn2547VrfEntry 3 }

ppvpn2547VrfDescription OBJECT-TYPE
    SYNTAX      SnmpAdminString
    STATUS      current
    DESCRIPTION
        "The human-readable description of this VRF."
    ::= { ppvpn2547VrfEntry 4 }

ppvpn2547VrfRD OBJECT-TYPE
    SYNTAX      Ppvpn2547RouteDistinguisher
    STATUS      current
    DESCRIPTION
        "The route distinguisher for this VRF."
    ::= { ppvpn2547VrfEntry 5 }

ppvpn2547VrfMaxRoutes OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
```

DESCRIPTION

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```
    "Denotes maximum number of routes which this VRF is
      configured to hold."
 ::= { ppvnp2547VrfEntry 6 }
```

```
--
-- BGP/MPLS VPN Route Target Table
--
```

```
ppvnp2547RouteTargetTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Ppvnp2547RouteTargetEntry
    PIB-ACCESS  install
    STATUS      current
    DESCRIPTION
        "This table specifies per-VRF route target association.
         Each entry identifies a connectivity policy supported as
         part of a VPN."
 ::= { ppvnp2547PolicyClasses 2 }
```

```
ppvnp2547RouteTargetEntry OBJECT-TYPE
    SYNTAX      Ppvnp2547RouteTargetEntry
    STATUS      current
    DESCRIPTION
        "An entry in this table is created for each route target
         configured for a VRF supporting a MPLS/BGP VPN instance."
    PIB-INDEX  { ppvnp2547RouteTargetPrid}
    UNIQUENESS { ppvnp2547RouteTargetVrfId,
                 ppvnp2547RouteTargetType,
                 ppvnp2547RouteTargetPrecedence,
                 ppvnp2547RouteTargetRT
               }
 ::= { ppvnp2547RouteTargetTable 1 }
```

```
ppvnp2547RouteTargetEntry ::= SEQUENCE {
    ppvnp2547RouteTargetPrid      InstanceId,
    ppvnp2547RouteTargetType      INTEGER,
    ppvnp2547RouteTargetVrfId     TagId,
    ppvnp2547RouteTargetRT        Ppvnp2547RouteTarget,
    ppvnp2547RouteTargetDescr     DisplayString
}
```

```
ppvnp2547RouteTargetPrid OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
         instance of the class."
 ::= { ppvnp2547RouteTargetEntry 1 }
```



```
ppvnp2547RouteTargetType OBJECT-TYPE
    SYNTAX          INTEGER { import(1),
                              export(2),
                              both(3) }
    STATUS           current
    DESCRIPTION
        "The route target distribution type."
    ::= { ppvnp2547RouteTargetEntry 2 }
```

```
ppvnp2547RouteTargetVrfId OBJECT-TYPE
    SYNTAX          TagId
    STATUS           current
    DESCRIPTION
        "A VRF is composed of an import RT list and a export RT
        list. Each RT belonging to the same VRF uses the same VRF
        ID. Hence, a VRF Id identifies which this RT is a part of.
        This needs to be the value of ppvnp2547VrfId attribute for
        an existing instance of ppvnp2547VrfEntry."
    ::= { ppvnp2547RouteTargetEntry 3 }
```

```
ppvnp2547RouteTargetRT OBJECT-TYPE
    SYNTAX          Ppvnp2547RouteTarget
    STATUS           current
    DESCRIPTION
        "The route target value."
    ::= { ppvnp2547RouteTargetEntry 4 }
```

```
ppvnp2547RouteTargetDescr OBJECT-TYPE
    SYNTAX          DisplayString
    STATUS           current
    DESCRIPTION
        "Description of the route target."
    ::= { ppvnp2547RouteTargetEntry 5 }
```

```
--
-- BGP/MPLS VPN Interface Table
--
```

```
ppvnp2547IfTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF Ppvnp2547IfEntry
    PIB-ACCESS      install
    STATUS           current
    DESCRIPTION
        "This table specifies per customer interface configuration
        information ."
    ::= { ppvnp2547PolicyClasses 3 }
```

ppvpn2547IfEntry OBJECT-TYPE

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```

SYNTAX          Ppvnp2547IfEntry
STATUS          current
DESCRIPTION
    "An entry in this table is created for every interface
    type supporting MPLS/BGP VPN. Each entry in this table is
    meant to correspond to an entry in the Interfaces Table."
PIB-INDEX { ppvnp2547IfPrid }
UNIQUENESS { ppvnp2547IfRoles,
              ppvnp2547IfName }
 ::= { ppvnp2547IfTable 1 }

ppvnp2547IfEntry ::= SEQUENCE {
    ppvnp2547IfPrid          InstanceId,
    ppvnp2547IfIndex        ReferenceId,
    ppvnp2547IfEdgeType     INTEGER,
    ppvnp2547IfVpnClassification INTEGER,
    ppvnp2547IfRouteDistProtocol BITS
}

ppvnp2547IfPrid OBJECT-TYPE
    SYNTAX          InstanceId
    STATUS          current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
        instance of the class."
    ::= { ppvnp2547IfEntry 1 }

ppvnp2547IfIndex OBJECT-TYPE
    SYNTAX          ReferenceId
    PIB-REFERENCES { frwkRoleCombinationEntry }
    STATUS          current
    DESCRIPTION
        "The interface capability set to configure. The interface
        capability name specified by this attribute must exist in
        the frwkIfCapSetTable [FR-PIB] prior to association with
        an instance of this class."
    ::= { ppvnp2547IfEntry 2 }

ppvnp2547IfCustomerEdgeType OBJECT-TYPE
    SYNTAX          INTEGER { providerEdge (1)
                             customerEdge (2)
    }
    STATUS          current
    DESCRIPTION
        " The Customer Edge can be either another Provider Edge
        (PE) in the case of a multi-AS VPN or a stub Customer
        Edge (CE) in case of an enterprise VPN. Either the
        providerEdge (PE) or customerEdge (CE) bit must be set

```


accordingly."

```
::= { ppvpn2547IfEntry 3 }
```

```
ppvnp2547IfVpnClassification OBJECT-TYPE
```

```
SYNTAX          INTEGER { enterprise (1),  
                        cc (2),  
                        interProviderOption1 (3)  
                        interProviderOption2 (4)  
                        interProviderOption3 (5)
```

```
}
```

```
STATUS          current
```

```
DESCRIPTION
```

```
"Denotes which VPN scenario this PE-CE link participates  
in:
```

- enterprise
- carrier's carrier
- inter-provider option 1 (VRF-to-VRF connections)
- inter-provider option 2 (MP-eBGP redistribution)
- inter-provider option 3 (multi-hop MP-eBGP)"

```
::= { ppvpn2547IfEntry 4 }
```

```
ppvnp2547IfRouteDistProtocol OBJECT-TYPE
```

```
SYNTAX          BITS { none (0),  
                    ebgp (1),  
                    ospf (2),  
                    rip (3),  
                    isis (4)
```

```
}
```

```
STATUS          current
```

```
DESCRIPTION
```

```
"Denotes the route distribution protocol across the  
customer interface protocol. Note that more than one  
routing protocol may be enabled at the same time.  
Moreover, according to [2547bis], in the case this  
interface participates in a hierarchical (CsC) or  
recursive (multi-AS) VPN, the routing protocol across  
this PE-CE link must be eBGP."
```

```
::= { ppvpn2547IfEntry 5 }
```

```
--  
-- BGP/MPLS VPN ORF Peer Table  
--
```

```
ppvnp2547OrfPeerTable OBJECT-TYPE
```

```
SYNTAX          SEQUENCE OF Ppvnp2547OrfPeerEntry
```

```
PIB-ACCESS      install
```

```
STATUS          current
```

```
DESCRIPTION
```

"Each entry in this table specifies a iBGP peer of the

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```
        device."
 ::= { ppvnp2547PolicyClasses 4 }

ppvnp25470rfPeerEntry OBJECT-TYPE
    SYNTAX      Ppvnp25470rfPeerEntry
    STATUS      current
    DESCRIPTION
        "An entry in this table is created by the PDP for
         every distinct PE which may exchange VPN membership and
         reachability information with the device."
    PIB-INDEX  { ppvnp25470rfPeerPrid }
    UNIQUENESS { ppvnp25470rfPeerAddrType,
                 ppvnp25470rfPeerAddr
    }
 ::= { ppvnp25470rfPeerTable 1 }

ppvnp25470rfPeerEntry ::= SEQUENCE {
    ppvnp25470rfPeerPrid      InstanceId,
    ppvnp25470rfPeerRole     INTEGER,
    ppvnp25470rfPeerAddrType InetAddressType,
    ppvnp25470rfPeerAddr     InetAddress
}

ppvnp25470rfPeerPrid OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
         instance of the class."
 ::= { ppvnp25470rfPeerEntry 1 }

ppvnp25470rfPeerRole OBJECT-TYPE
    SYNTAX      INTEGER { pe(1),
                        rr(2)
    }
    STATUS      current
    DESCRIPTION
        "Denotes the role played by this BGP peer. rr(0) stands
         for Route Reflector, pe(1) stands for Provider Edge"
 ::= { ppvnp25470rfPeerEntry 2 }

ppvnp25470rfPeerAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    STATUS      current
    DESCRIPTION
        "Denotes the address family of the PE address."
 ::= { ppvnp25470rfPeerEntry 3 }
```

ppvpn25470rfPeerAddr OBJECT-TYPE

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```
SYNTAX      InetAddress
STATUS      current
DESCRIPTION
    "Denotes the EBGp neighbor address."
::= { ppvnp25470rfPeerEntry 4 }
```

-- BGP/MPLS VPN Feedback Classes

--
-- BGP/MPLS VPN Route Count Usage Table
--

```
ppvnp2547RouteCountUsageTable OBJECT-TYPE
SYNTAX      SEQUENCE OF Ppvnp2547RouteCountUsageEntry
PIB-ACCESS  report-only
STATUS      current
DESCRIPTION
    "This class defines the usage attributes that the PEP is to
    monitor for VRFs. All routes hold by the VRF are counted.
    It also contains the PRID of the linkage instance
    associating the selection criteria with the usage
    instance."
::= { ppvnp2547FeedbackClasses 1 }
```

```
ppvnp2547RouteCountUsageEntry OBJECT-TYPE
SYNTAX      Ppvnp2547RouteCountUsageEntry
STATUS      current
DESCRIPTION
    "Defines the attributes the PEP is to monitor, record and
    report."
PIB-INDEX  { ppvnp2547RouteCountUsagePrid }
UNIQUENESS { ppvnp2547RouteCountUsageLinkRefId }
::= { ppvnp2547RouteCountUsageTable 1 }
```

```
ppvnp2547RouteCountUsageEntry ::= SEQUENCE {
    ppvnp2547RouteCountUsagePrid      InstanceId,
    ppvnp2547RouteCountUsageLinkRefId ReferenceId,
    ppvnp2547RouteCountUsageCount     Counter32
}
```

```
ppvnp2547RouteCountUsagePrid OBJECT-TYPE
SYNTAX      InstanceId
STATUS      current
DESCRIPTION
    "An arbitrary integer index that uniquely identifies an
    instance of the class."
::= { ppvnp2547RouteCountUsageEntry 1 }
```


ppvnp2547RouteCountUsageLinkRefId OBJECT-TYPE

SYNTAX ReferenceId

PIB-REFERENCES { frwkFeedBackLinkEntry }

STATUS current

DESCRIPTION

"The ReferenceId of the Linkage Policy instance used to base this usage policy instance upon."

::= { ppvnp2547RouteCountUsageEntry 2 }

ppvnp2547RouteCountUsageCount OBJECT-TYPE

SYNTAX Counter32

STATUS current

DESCRIPTION

"The count of Routes hold by the associated VRF during the reporting interval."

::= { ppvnp2547RouteCountUsageEntry 3 }

--

-- BGP/MPLS VPN Label Count Usage Table

--

ppvnp2547LabelCountUsageTable OBJECT-TYPE

SYNTAX SEQUENCE OF Ppvnp2547LabelCountUsageEntry

PIB-ACCESS report-only

STATUS current

DESCRIPTION

"This class defines the usage attributes that the PEP is to monitor for VRFs. All labels illegally received by the VRF are counted. It also contains the PRID of the linkage instance associating the selection criteria with the usage instance."

::= { ppvnp2547FeedbackClasses 2 }

ppvnp2547LabelCountUsageEntry OBJECT-TYPE

SYNTAX Ppvnp2547LabelCountUsageEntry

STATUS current

DESCRIPTION

"Defines the attributes the PEP is to monitor, record and report."

PIB-INDEX { ppvnp2547LabelCountUsagePrid }

UNIQUENESS { ppvnp2547LabelCountUsageLinkRefId }

::= { ppvnp2547LabelCountUsageTable 1 }

ppvnp2547LabelCountUsageEntry ::= SEQUENCE {

ppvnp2547LabelCountUsagePrid InstanceId,

ppvnp2547LabelCountUsageLinkRefId ReferenceId,

ppvnp2547LabelCountUsageCount Counter32

}

```
ppvnp2547LabelCountUsagePrid OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
         instance of the class."
    ::= { ppvnp2547LabelCountUsageEntry 1 }

ppvnp2547LabelCountUsageLinkRefId OBJECT-TYPE
    SYNTAX      ReferenceId
    PIB-REFERENCES { frwkFeedBackLinkEntry }
    STATUS      current
    DESCRIPTION
        "The ReferenceId of the Linkage Policy instance used to
         base this usage policy instance upon."
    ::= { ppvnp2547LabelCountUsageEntry 2 }

ppvnp2547LabelCountUsageCount OBJECT-TYPE
    SYNTAX      Counter32
    STATUS      current
    DESCRIPTION
        "The count of labels illegally received by the associated
         VRF during the reporting interval."
    ::= { ppvnp2547LabelCountUsageEntry 3 }

--
-- BGP/MPLS VPN Threshold Table
--

ppvnp2547ThresholdTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Ppvnp2547ThresholdEntry
    PIB-ACCESS  install
    STATUS      current
    DESCRIPTION
        "This class defines the threshold attributes corresponding
         to usage attributes specified in the
         ppvnp2547RouteCountUsageTable and
         ppvnp2547LabelCountUsageTable classes."
    ::= { ppvnp2547FeedbackClasses 3 }

ppvnp2547ThresholdEntry OBJECT-TYPE
    SYNTAX      Ppvnp2547ThresholdEntry
    STATUS      current
    DESCRIPTION
        "Defines the attributes to hold threshold values."
    PIB-INDEX { ppvnp2547ThresholdPrid }
    ::= { ppvnp2547ThresholdTable 1 }
```



```
ppvnp2547ThresholdEntry ::= SEQUENCE {
    ppvnp2547ThresholdPrid InstanceId,
    ppvnp2547ThresholdThresh Unsigned32
}
```

```
ppvnp2547ThresholdPrid OBJECT-TYPE
    SYNTAX InstanceId
    STATUS current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
        instance of the class."
    ::= { ppvnp2547ThresholdEntry 1 }
```

```
ppvnp2547ThresholdThresh OBJECT-TYPE
    SYNTAX Unsigned32
    STATUS current
    DESCRIPTION
        "The threshold, in terms of number of routes or labels,
        that must be exceeded to trigger a report in the next
        reporting interval."
    ::= { ppvnp2547ThresholdEntry 2 }
```

```
--
-- BGP/MPLS VPN VRF Selection Table
--
```

```
ppvnp2547VrfSelectionTable OBJECT-TYPE
    SYNTAX SEQUENCE OF Ppvnp2547VrfSelectionEntry
    PIB-ACCESS install
    STATUS current
    DESCRIPTION
        "This class defines a selection criteria that identifies a
        specific VRF to collect usage information from."
    ::= { ppvnp2547FeedbackClasses 4 }
```

```
ppvnp2547VrfSelectionEntry OBJECT-TYPE
    SYNTAX Ppvnp2547VrfSelectionEntry
    STATUS current
    DESCRIPTION
        "Defines the attributes of the selection criteria
        identifying a specific policy where to monitor the
        associated usage."
    PIB-INDEX { ppvnp2547VrfSelectionPrid }
    UNIQUENESS { ppvnp2547VrfSelectionVrf }
    ::= { ppvnp2547VrfSelectionTable 1 }
```

```
ppvnp2547VrfSelectionEntry ::= SEQUENCE {
    ppvnp2547VrfSelectionPrid InstanceId,
```

ppvpn2547VrfSelectionId ReferenceId

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}

ppvnp2547VrfSelectionPrid OBJECT-TYPE
SYNTAX InstanceId
STATUS current
DESCRIPTION
"An arbitrary integer index that uniquely identifies an
instance of the class."
::= { ppvnp2547VrfSelectionEntry 1 }

ppvnp2547VrfSelectionId OBJECT-TYPE
SYNTAX ReferenceId
PIB-REFERENCES { ppvnp2547VrfEntry }
STATUS current
DESCRIPTION
"The Prid of the VRF that one wants to collect usage
information from."
::= { ppvnp2547VrfSelectionEntry 2 }

-- Conformance Section

ppvnp2547PibCompliances
OBJECT IDENTIFIER ::= { ppvnp2547PibConformance 1 }
ppvnp2547PibGroups
OBJECT IDENTIFIER ::= { ppvnp2547PibConformance 2 }

ppvnp2547PibCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"Describes the requirements for conformance to the
PPVPN BGP/MPLS VPN Policy PIB."

MODULE -- this module
MANDATORY-GROUPS {
ppvnp2547PibVrfGroup,
ppvnp2547PibRouteTargetGroup,
ppvnp2547PibIfGroup,
ppvnp2547PibOrfPeerGroup,
ppvnp2547PibRouteGroup,
ppvnp2547PibRouteCountUsageGroup,
ppvnp2547PibLabelCountUsageGroup,
ppvnp2547PibThresholdGroup,
ppvnp2547PibVrfSelectionGroup
}
::= { ppvnp2547PibCompliances 1 }

ppvnp2547PibVrfGroup OBJECT-GROUP
OBJECTS { ppvnp2547VrfRoles,


```
        ppvpn2547VrfIfName,
        ppvpn2547VrfId,
        ppvpn2547VrfDescription,
        ppvpn2547VrfRD,
        ppvpn2547VrfMaxRoutes
    }
STATUS current
DESCRIPTION
    "The VRF Group defines the PIB Objects that describe a
    VRF."
 ::= { ppvpn2547PibGroups 1 }

ppvnp2547PibRouteTargetGroup OBJECT-GROUP
OBJECTS { ppvpn2547RouteTargetType,
          ppvpn2547RouteTargetVrfId,
          ppvpn2547RouteTargetRT,
          ppvpn2547RouteTargetDescr
        }
STATUS current
DESCRIPTION
    "The Route Target Group defines the PIB Objects that
    describe a Route Target."
 ::= { ppvpn2547PibGroups 2 }

ppvnp2547PibIfGroup OBJECT-GROUP
OBJECTS { ppvpn2547IfIndex,
          ppvpn2547IfVpnClassification,
          ppvpn2547IfRouteDistProtocol
        }
STATUS current
DESCRIPTION
    "The Interface Group defines the PIB Objects that
    describe a Interface."
 ::= { ppvpn2547PibGroups 3 }

ppvnp2547PibOrfPeerGroup OBJECT-GROUP
OBJECTS { ppvpn2547OrfPeerVrfId,
          ppvpn2547OrfPeerRole,
          ppvpn2547OrfPeerAddrType,
          ppvpn2547OrfPeerAddr
        }
STATUS current
DESCRIPTION
    "The BGP Peer Group defines the PIB Objects that
    describe a BGP Peer."
 ::= { ppvpn2547PibGroups 4 }

ppvnp2547PibRouteCountUsageGroup OBJECT-GROUP
```


OBJECTS { ppvpn2547RouteCountUsageLinkId,

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```
                ppvpn2547RouteCountUsageCount
            }
            STATUS current
            DESCRIPTION
                "The Route Count Usage Group defines the PIB Objects that
                describe a Route Count Usage class."
            ::= { ppvpn2547PibGroups 5 }

ppvpn2547PibLabelCountUsageGroup OBJECT-GROUP
    OBJECTS { ppvpn2547LabelCountUsageLinkRefId,
              ppvpn2547LabelCountUsageCount
            }
    STATUS current
    DESCRIPTION
        "The Label Count Usage Group defines the PIB Objects that
        describe a Label Count Usage class."
    ::= { ppvpn2547PibGroups 6 }

ppvpn2547PibThresholdGroup OBJECT-GROUP
    OBJECTS { ppvpn2547ThresholdThresh }
    STATUS current
    DESCRIPTION
        "The Threshold Group defines the PIB Objects that
        describe a Threshold class."
    ::= { ppvpn2547PibGroups 7 }

ppvpn2547PibVrfSelectionGroup OBJECT-GROUP
    OBJECTS { ppvpn2547VrfSelectionId }
    STATUS current
    DESCRIPTION
        "The VRF Selection Group defines the PIB Objects that
        describe a VRF Selection class."
    ::= { ppvpn2547PibGroups 8 }

END
```

9. Subject Category Considerations

The numbering space used for the BGP/MPLS VPN PIB, as indicated by the SUBJECT-CATEGORIES clause, will be assigned by the Internet Assigned Numbers Authority (IANA). Notice the numbering space used by SUBJECT-CATEGORIES maps to the Client Type numbering space in [COPS-PR]. This relationship is detailed in section 7.1 of [SPPI]. Due to the fact that Client Type value of 1 has already been used by [COPS-RSVP], the numbering space for SUBJECT-CATEGORIES will need to start with the value of 2.

Other PIB Modules may use the same SUBJECT-CATEGORIES as this BGP/MPLS VPN PIB Module. In such situations, PRC numbering space under a specific SUBJECT-CATEGORIES should be coordinated with existing PIB Modules using the same SUBJECT-CATEGORIES.

10. Intellectual Property Considerations

The IETF is being notified of intellectual property rights claimed in regard to some or all of the specification contained in this document. For more information consult the online list of claimed rights.

11. IANA Considerations

This document standardizes a Policy Information Base (PIB) module, requesting an IANA assigned PIB number.

Security Considerations

The information contained in a PIB when transported by the COPS protocol [[COPS-PR](#)] are sensitive, and its function of provisioning a PEP/EP requires that only authorized communication take place. The use of IPSEC between PDP and PEP, as described in [[COPS](#)], provides the necessary protection against these threats.

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