INTERNET-DRAFT
Intended Status: Proposed Standard
Expires: 2014-04-12

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2013-10-12

MPLS/BGP Layer 3 VPN Multicast Management Information Base

draft-ietf-l3vpn-mvpn-mib-04

Abstract

This memo defines an portion of the Management Information Base (MIB) for use with network management protocols in the Internet community.

In particular, it describes managed objects to configure and/or monitor multicast in MPLS/BGP-based Layer-3 VPN (MVPN) on an MVPN router.

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0 Draft history

This draft is a first pass at a MIB document for [MVPN]. As such, it should be considered as a early work.

Some aspects of BGP-MVPN (see definition below in "Introduction"), such as exranet, may be specified in future revisions.

[note to author/reviewers: conformance groups to be added]

[this section should be removed as soon as its stops being relevant]

1 Introduction

Multicast in MPLS/BGP L3 VPNs is specified in {[MVPN], [BGP-MVPN]}. These specifications support either PIM or BGP as the protocol for exchanging VPN multicast (referred to as C-multicast states, where 'C-' stands for 'VPN Customer-') among PEs. In the rest of this document we'll use the term "PIM-MVPN" to refer to {[MVPN], [BGP-MVPN]} with PIM being used for exchanging C-multicast states, and "BGP-MVPN" to refer to {[MVPN], [BGP-MVPN]} with BGP is used for exchanging C-multicast states.

This document defines a standard MIB for MVPN-specific objects that are generic to both PIM-MVPN and BGP-MVPN.

This document borrowed some text from Cisco PIM-MVPN MIB [CISCO-MIB]. For PIM-MVPN this document attempts to provide coverage comparable to [CISCO-MIB], but in a generic way that applies to both PIM-MVPN and BGP-MVPN.

Comments should be made directly to the Layer-3 VPN (L3VPN) WG at l3vpn@ietf.org.

1.1 Terminology

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 RFC 2119 [RFC2119].

This document adopts the definitions, acronyms and mechanisms described in [MVPN] and other documents that [MVPN] refers to. Familiarity with Multicast, MPLS, L3VPN, MVPN concepts and/or mechanisms is assumed.

Interchangeably, the term MVRF and MVPN are used to refer to a partiular Multicast VPN instantiation on a particular PE device.

2 MVPN MIB

This MIB enables configuring and/or monitoring of MVPNs on PE devices: the whole multicast VPN machinery and the per-MVRFs information, including the configuration, status and operational details, such as different PMSIs and the provider tunnels implementing them.

2.1 Summary of MIB Module

The configuration and states specific to an MVPN include the following:

- C-multicast routing exchange protocol (PIM or BGP)

- I-PMSI, S-PMSI and corresponding provider tunnels

- Mapping of c-multicast states to PMSI/tunnels

To represent them, the following tables are defined.

```
     +--------------+
     | MvpnBgp      |
     | General      |
     +--------------+    +-------------------+    +-----------------+
     | MvpnGeneral  | -> |   MvpnPmsiConfig  | <- | MvpnSpmsiConfig |
     +--------------+    +-------------------+    +-----------------+


     +--------------+    +-------------------+    +-----------------+
     |  MvpnIpmsi   | -> | L2L3VpnMcastPmsi  | <- |    MvpnSpmsi    |
     +--------------+    | TunnelAttribute   |    +-----------------+
                       -> +-------------------+
                      /            ^
                     /             |
     +--------------+    +-------------------+
     | MvpnInterAs  |    |    MvpnMroute     |
     |   Ipmsi      |    +-------------------+
     +--------------+
```

- mvpnGeneralTable/Entry

  An entry in this table is created for every MVRF in the device, for general configuration/states of the MVRF, including I-PMSI configuration.

  Existence of the corresponding VRF in [L3VPN-MIB] is necessary for

a row to exist in this table.

- mvpnBgpGeneralTable/Entry

  This table augments mvpnGeneralTable and is for BGP-MVPN specific information.

- mvpnSpmsiConfigTable/Entry

  This table contains objects for S-PMSI configurations in an MVRF.

- mvpnPmsiConfigTable/Entry

  Both I-PMSI configuration (in mvpnGeneralEntry) and S-PMSI configuration (in mvpnSpmsiConfigEntry) refer to entries in this table.

- mvpnIpmsiTable/Entry

  This table contains all advertised or received intra-as I-PMSIs. With PIM-MVPN, it is applicable only when BGP-Based Autodiscovery of MVPN Membership is used.

- mvpnInterAsIpmsiTable/Entry

  This table contains all advertised or received inter-as I-PMSIs. With PIM-MVPN, it is applicable only when BGP-Based Autodiscovery of MVPN Membership is used.

- mvpnSpmsiTable/Etnry

  This table contains all advertised or received S-PMSIs.

- l2l3VpnMcastPmsiTunnelAttributeTable/Entry

  This table is defined separately in l2L3VpnMcastMIB [L2L3MVPN-MIB], which is common for both VPLS Multicast and MVPN. It contains sent/received PMSI attribute entries referred to by mvpnIpmsiEntry, mvpnSpmsiEntry, mvpnInterAsIpmsiEntry, and other MIB objects (e.g., VPLS Multicast ones).

- mvpnMrouteTable/Entry

  This table augments ipMcastMIB.ipMcast.ipMcastRouteTable, for some MVPN specific information.

2.2 MIB Module Definitions

```
MCAST-VPN-MIB DEFINITIONS ::= BEGIN

IMPORTS
   MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
   experimental, Unsigned32
      FROM SNMPv2-SMI

   MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
      FROM SNMPv2-CONF

   TruthValue, RowPointer, RowStatus, TimeStamp, TimeInterval
      FROM SNMPv2-TC

   SnmpAdminString
      FROM SNMP-FRAMEWORK-MIB

   InetAddress, InetAddressType
      FROM INET-ADDRESS-MIB

   MplsLabel
      FROM MPLS-TC-STD-MIB

   mplsL3VpnVrfName, MplsL3VpnRouteDistinguisher
      FROM MPLS-L3VPN-STD-MIB

   ipMcastRouteEntry
     FROM IPMCAST-MIB

   L2L3VpnMcastProviderTunnelType
      FROM L2L3-VPN-MCAST-MIB;

mvpnMIB MODULE-IDENTITY
   LAST-UPDATED "201301071200Z"  -- 07 January 2013 12:00:00 GMT
   ORGANIZATION "IETF Layer-3 Virtual Private
                 Networks Working Group."
   CONTACT-INFO
          " Jeffrey (Zhaohui) Zhang
            zzhang@juniper.net

            Comments and discussion to l3vpn@ietf.org"

   DESCRIPTION
        "This MIB contains managed object definitions for
         multicast in BGP/MPLS IP VPNs defined by [MVPN].
         Copyright (C) The Internet Society (2013)."

  -- Revision history.
   REVISION "201301071200Z"  -- 07 January 2013 12:00:00 GMT
```

```
        DESCRIPTION
           "Initial version of the draft."
        ::= { experimental 99 } -- number to be assigned

     -- Top level components of this MIB.
     mvpnNotifications OBJECT IDENTIFIER ::= { mvpnMIB 0 }

     -- tables, scalars
     mvpnObjects       OBJECT IDENTIFIER ::= { mvpnMIB 1 }

     -- conformance information
     mvpnConformance   OBJECT IDENTIFIER ::= { mvpnMIB 2 }

     -- mvpn Objects

     mvpnScalars       OBJECT IDENTIFIER ::= { mvpnObjects 1 }
     mvpnGeneral       OBJECT IDENTIFIER ::= { mvpnObjects 2 }
     mvpnConfig        OBJECT IDENTIFIER ::= { mvpnObjects 3 }
     mvpnStates        OBJECT IDENTIFIER ::= { mvpnObjects 4 }

     -- Scalar Objects

     mvpnMvrfNumber OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The number of MVRFs for IPv4 or IPv6 or mLDP C-Multicast
             that are present in this device."
        ::= { mvpnScalars 1 }

     mvpnMvrfNumberV4 OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The number of MVRFs for IPv4 C-Multicast that are present
             in this device."
        ::= { mvpnScalars 2 }

     mvpnMvrfNumberV6 OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The number of MVRFs for IPv6 C-Multicast that are present
             in this device."
        ::= { mvpnScalars 3 }
```

```
     mvpnMvrfNumberPimV4 OBJECT-TYPE
        SYNTAX         Unsigned32
        MAX-ACCESS     read-only
        STATUS         current
        DESCRIPTION
            "The number of PIM-MVPN MVRFs for IPv4 C-Multicast that are present
             in this device."
        ::= { mvpnScalars 4 }

     mvpnMvrfNumberPimV6 OBJECT-TYPE
        SYNTAX         Unsigned32
        MAX-ACCESS     read-only
        STATUS         current
        DESCRIPTION
            "The number of PIM-MVPN MVRFs for IPv6 C-Multicast that are present
             in this device."
        ::= { mvpnScalars 5 }

     mvpnMvrfNumberBgpV4 OBJECT-TYPE
        SYNTAX         Unsigned32
        MAX-ACCESS     read-only
        STATUS         current
        DESCRIPTION
            "The number of BGP-MVPN MVRFs for IPv4 C-Multicast that are present
             in this device."
        ::= { mvpnScalars 6 }

     mvpnMvrfNumberBgpV6 OBJECT-TYPE
        SYNTAX         Unsigned32
        MAX-ACCESS     read-only
        STATUS         current
        DESCRIPTION
            "The number of BGP-MVPN MVRFs for IPv6 C-Multicast that are present
             in this device."
        ::= { mvpnScalars 7 }

     mvpnMvrfNumberMldp OBJECT-TYPE
        SYNTAX         Unsigned32
        MAX-ACCESS     read-only
        STATUS         current
        DESCRIPTION
            "The number of BGP-MVPN MVRFs for mLDP C-Multicast that are present
             in this device."
        ::= { mvpnScalars 8 }

     mvpnNotificationEnable OBJECT-TYPE
        SYNTAX        TruthValue
        MAX-ACCESS    read-write
```

```
        STATUS        current
        DESCRIPTION
             "If this object is TRUE, then the generation of all
              notifications defined in this MIB is enabled."
        DEFVAL { false }
        ::= { mvpnScalars 9 }

     -- General MVRF Information Table

     mvpnGeneralTable  OBJECT-TYPE
        SYNTAX        SEQUENCE OF MvpnGeneralEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "This table specifies the general information about the MVRFs
             present in this device."
        ::= { mvpnGeneral 1 }

     mvpnGeneralEntry OBJECT-TYPE
        SYNTAX        MvpnGeneralEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "An entry in this table is created for every MVRF in the
             device."
        INDEX       { mplsL3VpnVrfName }
        ::= { mvpnGeneralTable 1 }

     MvpnGeneralEntry ::= SEQUENCE {
        mvpnGenOperStatusChange         INTEGER,
        mvpnGenOperChangeTime           TimeStamp,
        mvpnGenCmcastRouteProtocolV4    INTEGER,
        mvpnGenCmcastRouteProtocolV6    INTEGER,
        mvpnGenIpmsiConfigV4            RowPointer,
        mvpnGenIpmsiConfigV6            RowPointer,
        mvpnGenInterAsPmsiConfigV4      RowPointer,
        mvpnGenInterAsPmsiConfigV6      RowPointer,
        mvpnGenRowStatus                RowStatus
     }

     mvpnGenOperStatusChange OBJECT-TYPE
        SYNTAX      INTEGER { createdMvrf(1),
                              deletedMvrf(2),
                              modifiedMvrfIpmsiConfig(3),
                              modifiedMvrfSpmsiConfig(4)
                             }
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
            "This object describes the last operational change that
             happened for the given MVRF.

             createdMvrf - indicates that the MVRF was created in the
             device.

             deletedMvrf - indicates that the MVRF was deleted from the
             device. A row in this table will never have
             mvpnGenOperStatusChange equal to deletedMvrf(2),
             because in that case the row itself will be deleted from the
             table. This value for mvpnGenOperStatusChange is defined
             mainly for use in mvpnMvrfChange notification.

             modifiedMvrfIpmsiConfig - indicates that the I-PMSI
             for the MVRF was configured, deleted or changed.

             modifiedMvrfSpmsiConfig - indicates that the S-PMSI
             for the MVRF was configured, deleted or changed."
        DEFVAL { createdMvrf }
        ::= { mvpnGeneralEntry 1 }

     mvpnGenOperChangeTime OBJECT-TYPE
        SYNTAX        TimeStamp
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The time at which the last operational change for the MVRF in
             question took place. The last operational change is specified
             by mvpnGenOperStatusChange."
        ::= { mvpnGeneralEntry 2 }

     mvpnGenCmcastRouteProtocolV4 OBJECT-TYPE
        SYNTAX        INTEGER { pim (1),
                                bgp (2)
                              }
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "Protocol used to signal IPv4 C-multicast states across the
             provider core.
             pim(1): PIM (PIM-MVPN).
             bgp(2): BGP (BGP-MVPN)."
        ::= { mvpnGeneralEntry 3 }

     mvpnGenCmcastRouteProtocolV6 OBJECT-TYPE
        SYNTAX        INTEGER { pim (1),
                                bgp (2)
```

```
                                }
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "Protocol used to signal IPv6 C-multicast states across the
             provider core.
             pim(1): PIM (PIM-MVPN).
             bgp(2): BGP (BGP-MVPN)."
        ::= { mvpnGeneralEntry 4 }

     mvpnGenIpmsiConfigV4 OBJECT-TYPE
        SYNTAX        RowPointer
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "This points to a row in mvpnPmsiConfigTable,
             for I-PMSI configuration for IPv4."
        ::= { mvpnGeneralEntry 5 }

     mvpnGenIpmsiConfigV6 OBJECT-TYPE
        SYNTAX        RowPointer
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "This points to a row in mvpnPmsiConfigTable,
             for I-PMSI configuration for IPv6."
        ::= { mvpnGeneralEntry 6 }

     mvpnGenInterAsPmsiConfigV4 OBJECT-TYPE
        SYNTAX        RowPointer
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "This points to a row in mvpnPmsiConfigTable,
             for inter-as I-PMSI configuration for IPv4, in case of segmented
             inter-as provider tunnels."
        ::= { mvpnGeneralEntry 7 }

     mvpnGenInterAsPmsiConfigV6 OBJECT-TYPE
        SYNTAX        RowPointer
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "This points to a row in mvpnPmsiConfigTable,
             for inter-as I-PMSI configuration for IPv6, in case of segmented
             inter-as provider tunnels."
        ::= { mvpnGeneralEntry 8 }
```

```
     mvpnGenRowStatus OBJECT-TYPE
        SYNTAX        RowStatus
        MAX-ACCESS    read-create
        STATUS        current
        DESCRIPTION
            "This is used to create or delete a row in this table."
        ::= { mvpnGeneralEntry 9 }

     -- General BGP-MVPN table

     mvpnBgpGeneralTable OBJECT-TYPE
        SYNTAX        SEQUENCE OF MvpnBgpGeneralEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "This table augments the mvpnGeneralTable and is for BGP-MVPN
             specific information."
        ::= { mvpnGeneral 2 }

     mvpnBgpGeneralEntry OBJECT-TYPE
        SYNTAX           MvpnBgpGeneralEntry
        MAX-ACCESS       not-accessible
        STATUS           current
        DESCRIPTION
            "The mvpnBgpGeneralEntry matches and augments an mvpnGeneralEntry
             for a BGP-MVPN instance, with BGP-MVPN specific informatoin."
        AUGMENTS      { mvpnGeneralEntry }
     ::= { mvpnBgpGeneralTable 1 }

     MvpnBgpGeneralEntry ::= SEQUENCE {
        mvpnBgpGenMode           INTEGER,
        mvpnBgpGenUmhSelection   INTEGER,
        mvpnBgpGenSiteType       INTEGER,
        mvpnBgpGenCmcastImportRt MplsL3VpnRouteDistinguisher,
        mvpnBgpGenSrcAs          Unsigned32,
        mvpnBgpGenSptnlLimit     Unsigned32
     }

     mvpnBgpGenMode       OBJECT-TYPE
        SYNTAX            INTEGER {
                                rpt-spt  (1),
                                spt-only (2)
                          }
        MAX-ACCESS        read-write
        STATUS            current
        DESCRIPTION
            "For two different BGP-MVPN modes:
             rpt-spt(1):  intersite-site shared tree mode
```

```
             spt-only(2): inter-site source-only tree mode."
        ::= { mvpnBgpGeneralEntry 1}

     mvpnBgpGenUmhSelection OBJECT-TYPE
        SYNTAX              INTEGER {
                                highest-pe-address   (1),
                                c-root-group-hashing (2),
                                ucast-umh-route      (3)
                            }
        MAX-ACCESS          read-write
        STATUS              current
        DESCRIPTION
            "The UMH selection method for this mvpn, as specified in section
             5.1.3 of [MVPN]:
               highest-pe-address   (1): PE with the highest address
               c-root-group-hashing (2): hashing based on (c-root, c-group)
               uncast-umh-route     (3): per ucast route towards c-root"

        ::= { mvpnBgpGeneralEntry 2}

     mvpnBgpGenSiteType   OBJECT-TYPE
        SYNTAX            INTEGER {
                                sender-receiver (1),
                                receiver-only   (2),
                                sender-only     (3)
                            }
        MAX-ACCESS        read-write
        STATUS            current
        DESCRIPTION
            "Whether this site is a receiver-only site or not.
             sender-receiver (1):   both sender and receiver site.
             receiver-only   (2):   receiver-only site.
             sender-only     (3):   sender-only site."
        ::= { mvpnBgpGeneralEntry 3}

     mvpnBgpGenCmcastImportRt   OBJECT-TYPE
        SYNTAX                  MplsL3VpnRouteDistinguisher
        MAX-ACCESS              read-write
        STATUS                  current
        DESCRIPTION
            "The C-multicast Import RT that this device adds to
             unicast vpn routes that it advertises for this mvpn."
        ::= { mvpnBgpGeneralEntry 4}

     mvpnBgpGenSrcAs      OBJECT-TYPE
        SYNTAX            Unsigned32
        MAX-ACCESS        read-only
        STATUS            current
```

```
        DESCRIPTION
            "The Source AS number in Source AS Extended Community that this
device
             adds to the unicast vpn routes that it advertises for this mvpn."
        ::= { mvpnBgpGeneralEntry 5}

     mvpnBgpGenSptnlLimit OBJECT-TYPE
        SYNTAX            Unsigned32
        MAX-ACCESS        read-write
        STATUS            current
        DESCRIPTION
            "The max number of selective provider tunnels this device allows
             for this mvpn."
        ::= { mvpnBgpGeneralEntry 6}

     -- PMSI Configuration Table

     mvpnPmsiConfigTable  OBJECT-TYPE
        SYNTAX        SEQUENCE OF MvpnPmsiConfigEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "This table specifies the configured PMSIs."
        ::= { mvpnConfig 1 }

     mvpnPmsiConfigEntry OBJECT-TYPE
        SYNTAX        MvpnPmsiConfigEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "An entry in this table is created for each PMSI configured
             on this router. It can be referred to by either I-PMSI
             configuration (in mvpnGeneralEntry) or S-PMSI configuration
             (in mvpnSpmsiConfigEntry)"
        INDEX       { mvpnPmsiConfigTunnelType,
                      mvpnPmsiConfigTunnelAuxInfo,
                      mvpnPmsiConfigTunnelPimGroupAddressType,
                      mvpnPmsiConfigTunnelPimGroupAddress,
                      mvpnPmsiConfigTunnelOrTemplateName }
        ::= { mvpnPmsiConfigTable 1 }

     MvpnPmsiConfigEntry ::= SEQUENCE {
       mvpnPmsiConfigTunnelType                 L2L3VpnMcastProviderTunnelType,
       mvpnPmsiConfigTunnelAuxInfo              Unsigned32,
       mvpnPmsiConfigTunnelPimGroupAddressType  InetAddressType,
       mvpnPmsiConfigTunnelPimGroupAddress      InetAddress,
       mvpnPmsiConfigTunnelOrTemplateName       SnmpAdminString,
       mvpnPmsiConfigEncapsType                 INTEGER,
```

```
       mvpnPmsiConfigRowStatus                  RowStatus
```

```
     }

     mvpnPmsiConfigTunnelType OBJECT-TYPE
        SYNTAX        L2L3VpnMcastProviderTunnelType
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "Type of tunnel used to instantiate the PMSI."
        ::= { mvpnPmsiConfigEntry 1 }

     mvpnPmsiConfigTunnelAuxInfo OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "Additional tunnel information depending on the type.
             pim:         In case of S-PMSI, number of groups starting at
                          mvpnPmsiConfigTunnelPimGroupAddress.
                          This allows a range of PIM provider tunnel
                          group addresses to be specified in S-PMSI case.
                          In I-PMSI case, it must be 1.
             rsvp-p2mp:   1 for statically specified rsvp-p2mp tunnel
                          2 for dynamically created rsvp-p2mp tunnel
             ingress-replication:
                          1 for using any existing p2p/mp2p lsp
                          2 for dynamically creating new p2p lsp"
        ::= { mvpnPmsiConfigEntry 2 }

     mvpnPmsiConfigTunnelPimGroupAddressType OBJECT-TYPE
        SYNTAX        InetAddressType
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "In case of PIM provider tunnel, the type of tunnel address."
        ::= { mvpnPmsiConfigEntry 3 }

     mvpnPmsiConfigTunnelPimGroupAddress OBJECT-TYPE
        SYNTAX        InetAddress
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "In case of PIM provider tunnel, the provider tunnel address."
        ::= { mvpnPmsiConfigEntry 4 }

     mvpnPmsiConfigTunnelOrTemplateName OBJECT-TYPE
        SYNTAX        SnmpAdminString
        MAX-ACCESS    not-accessible
        STATUS        current
```

```
        DESCRIPTION
            "The tunnel name or template name used to create tunnels.
             Depending on mvpnPmsiConfigTunnelType and
             mvpnPmsiConfigTunnelAuxInfo:

             dynamically created rsvp-p2mp tunnel:       template name
             statically specified rsvp-p2mp tunnel:      tunnel name
             ingress-replication using
               dynamically created lsps:                 template name
             other:                                      null"
        ::= { mvpnPmsiConfigEntry 5 }

     mvpnPmsiConfigEncapsType OBJECT-TYPE
        SYNTAX        INTEGER { greIp (1),
                                ipIp  (2),
                                mpls  (3)
                              }
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "The encapsulation type to be used, in case of PIM tunnel or
             ingress-replication."
        ::= { mvpnPmsiConfigEntry 6 }

     mvpnPmsiConfigRowStatus OBJECT-TYPE
        SYNTAX        RowStatus
        MAX-ACCESS    read-create
        STATUS        current
        DESCRIPTION
            "Used to create/modify/delete a row in this table."
       ::= { mvpnPmsiConfigEntry 7 }

     -- S-PMSI configuration table

     mvpnSpmsiConfigTable  OBJECT-TYPE
        SYNTAX        SEQUENCE OF MvpnSpmsiConfigEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "This table specifies S-PMSI configuration."
        ::= { mvpnConfig 2 }

     mvpnSpmsiConfigEntry OBJECT-TYPE
        SYNTAX        MvpnSpmsiConfigEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "An entry is created for each S-PMSI configuration."
```

```
        INDEX       {  mplsL3VpnVrfName,
                       mvpnSpmsiConfigCmcastAddressType,
                       mvpnSpmsiConfigCmcastGroupAddress,
                       mvpnSpmsiConfigCmcastGroupPrefixLen,
                       mvpnSpmsiConfigCmcastSourceAddress,
                       mvpnSpmsiConfigCmcastSourcePrefixLen }
        ::= { mvpnSpmsiConfigTable 1 }

     MvpnSpmsiConfigEntry ::= SEQUENCE {
        mvpnSpmsiConfigCmcastAddressType     InetAddressType,
        mvpnSpmsiConfigCmcastGroupAddress    InetAddress,
        mvpnSpmsiConfigCmcastGroupPrefixLen  Unsigned32,
        mvpnSpmsiConfigCmcastSourceAddress   InetAddress,
        mvpnSpmsiConfigCmcastSourcePrefixLen Unsigned32,
        mvpnSpmsiConfigThreshold             Unsigned32,
        mvpnSpmsiConfigPmsiPointer           RowPointer,
        mvpnSpmsiConfigRowStatus             RowStatus
     }

     mvpnSpmsiConfigCmcastAddressType OBJECT-TYPE
        SYNTAX        InetAddressType
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "Type of C-multicast address"
        ::= { mvpnSpmsiConfigEntry 1 }

     mvpnSpmsiConfigCmcastGroupAddress OBJECT-TYPE
        SYNTAX        InetAddress
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "C-multicast group address"
        ::= { mvpnSpmsiConfigEntry 2 }

     mvpnSpmsiConfigCmcastGroupPrefixLen OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "C-multicast group address prefix length.
             A group 0 (or ::0) with prefix length 32 (or 128)
             indicates wildcard group, while a group 0 (or ::0)
             with prefix length 0 indicates any group."
        ::= { mvpnSpmsiConfigEntry 3 }

     mvpnSpmsiConfigCmcastSourceAddress OBJECT-TYPE
        SYNTAX        InetAddress
```

```
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "C-multicast source address"
        ::= { mvpnSpmsiConfigEntry 4 }

     mvpnSpmsiConfigCmcastSourcePrefixLen OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "C-multicast source address prefix length.
             A source 0 (or ::0) with prefix length 32 (or 128)
             indicates a wildcard source, while a source 0 (or ::0)
             with prefix length 0 indicates any source."
        ::= { mvpnSpmsiConfigEntry 5 }

     mvpnSpmsiConfigThreshold OBJECT-TYPE
        SYNTAX        Unsigned32  (0..4294967295)
        UNITS         "kilobits per second"
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "The bandwidth threshold value which when exceeded for a
             multicast routing entry in the given MVRF, triggers usage
             of S-PMSI."
        ::= { mvpnSpmsiConfigEntry 6 }

     mvpnSpmsiConfigPmsiPointer OBJECT-TYPE
        SYNTAX        RowPointer
        MAX-ACCESS    read-write
        STATUS        current
        DESCRIPTION
            "This points to a row in mvpnPmsiConfigTable,
             to specify tunnel attributes."
        ::= { mvpnSpmsiConfigEntry 7 }

     mvpnSpmsiConfigRowStatus OBJECT-TYPE
        SYNTAX        RowStatus
        MAX-ACCESS    read-create
        STATUS        current
        DESCRIPTION
            "Used to create/modify/delete a row in this table."
       ::= { mvpnSpmsiConfigEntry 8 }

     -- Table of intra-as I-PMSIs advertised/received

     mvpnIpmsiTable OBJECT-TYPE
```

```
        SYNTAX        SEQUENCE OF MvpnIpmsiEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "This table is for all advertised/received I-PMSI
             advertisements."
        ::= { mvpnStates 1 }

     mvpnIpmsiEntry OBJECT-TYPE
        SYNTAX        MvpnIpmsiEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "An entry in this table corresponds to an I-PMSI
             advertisement that is advertised/received on this router.
             This represents all the sender PEs in the MVPN,
             with the provider tunnel they use to send traffic."
        INDEX  { mplsL3VpnVrfName,
                 mvpnIpmsiAfi,
                 mvpnIpmsiRD,
                 mvpnIpmsiOrigAddrType,
                 mvpnIpmsiOrigAddress }
        ::= { mvpnIpmsiTable 1 }

     MvpnIpmsiEntry ::= SEQUENCE {
        mvpnIpmsiAfi          Unsigned32,
        mvpnIpmsiRD           MplsL3VpnRouteDistinguisher,
        mvpnIpmsiOrigAddrType InetAddressType,
        mvpnIpmsiOrigAddress  InetAddress,
        mvpnIpmsiUpTime       TimeInterval,
        mvpnIpmsiAttribute    RowPointer
        }

     mvpnIpmsiAfi OBJECT-TYPE
        SYNTAX        Unsigned32 (1|2)
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The address family this I-PMSI is for.
             1 - IPv4
             2 - IPv6"
        ::= { mvpnIpmsiEntry 1 }

     mvpnIpmsiRD OBJECT-TYPE
        SYNTAX        MplsL3VpnRouteDistinguisher
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
```

```
            "The Route Distinguisher in this I-PMSI."
        ::= { mvpnIpmsiEntry 2 }

     mvpnIpmsiOrigAddrType OBJECT-TYPE
        SYNTAX        InetAddressType
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The Internet address type of mvpnIpmsiOrigAddress."
        ::= { mvpnIpmsiEntry 3 }

     mvpnIpmsiOrigAddress OBJECT-TYPE
        SYNTAX        InetAddress
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The BGP address of the device that originated the I-PMSI."
        ::= { mvpnIpmsiEntry 4 }

     mvpnIpmsiUpTime OBJECT-TYPE
        SYNTAX        TimeInterval
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The time since this I-PMSI
             was first advertised/received by the device."
        ::= { mvpnIpmsiEntry 5 }

     mvpnIpmsiAttribute OBJECT-TYPE
        SYNTAX        RowPointer
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "Points to a row in the l2L3VpnMcastPmsiTunnelAttributeTable."
        ::= { mvpnIpmsiEntry 6 }

     -- Table of inter-as I-PMSIs advertised/received

     mvpnInterAsIpmsiTable OBJECT-TYPE
        SYNTAX        SEQUENCE OF MvpnInterAsIpmsiEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "This table is for all advertised/received inter-as I-PMSI
             advertisements."
        ::= { mvpnStates 2 }

     mvpnInterAsIpmsiEntry OBJECT-TYPE
```

```
        SYNTAX        MvpnInterAsIpmsiEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "An entry in this table corresponds to an inter-as I-PMSI
             advertisement that is advertised/received on this router.
             This represents all the ASes in the MVPN,
             with the provider tunnel used to send traffic to."
        INDEX  { mplsL3VpnVrfName,
                 mvpnInterAsIpmsiAfi,
                 mvpnInterAsIpmsiRD,
                 mvpnInterAsIpmsiSrcAs }
        ::= { mvpnInterAsIpmsiTable 1 }

     MvpnInterAsIpmsiEntry ::= SEQUENCE {
        mvpnInterAsIpmsiAfi          Unsigned32,
        mvpnInterAsIpmsiRD           MplsL3VpnRouteDistinguisher,
        mvpnInterAsIpmsiSrcAs        Unsigned32,
        mvpnInterAsIpmsiAttribute    RowPointer
        }

     mvpnInterAsIpmsiAfi OBJECT-TYPE
        SYNTAX        Unsigned32 (1|2)
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The address family this I-PMSI is for.
             1 - IPv4
             2 - IPv6"
        ::= { mvpnInterAsIpmsiEntry 1 }

     mvpnInterAsIpmsiRD OBJECT-TYPE
        SYNTAX        MplsL3VpnRouteDistinguisher
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The Route Distinguisher in this inter-as I-PMSI."
        ::= { mvpnInterAsIpmsiEntry 2 }

     mvpnInterAsIpmsiSrcAs OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The source-as in this inter-as I-PMSI."
        ::= { mvpnInterAsIpmsiEntry 3 }

     mvpnInterAsIpmsiAttribute OBJECT-TYPE
```

```
        SYNTAX        RowPointer
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "Points to a row in the l2L3VpnMcastPmsiTunnelAttributeTable."
        ::= { mvpnInterAsIpmsiEntry 4 }

     -- Table of S-PMSIs advertised/received

     mvpnSpmsiTable OBJECT-TYPE
        SYNTAX        SEQUENCE OF MvpnSpmsiEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
               "This table has information about the S-PMSIs sent/received
                by a device."
        ::= { mvpnStates 3 }

     mvpnSpmsiEntry OBJECT-TYPE
        SYNTAX        MvpnSpmsiEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "An entry in this table is created or updated for every S-PMSI
             advertised/received in a particular MVRF."
        INDEX  { mplsL3VpnVrfName,
                 mvpnSpmsiCmcastAddrType,
                 mvpnSpmsiCmcastGroup,
                 mvpnSpmsiCmcastGroupPrefixLen,
                 mvpnSpmsiCmcastSource,
                 mvpnSpmsiCmcastSourcePrefixLen,
                 mvpnSpmsiOrigAddrType,
                 mvpnSpmsiOrigAddress}
        ::= { mvpnSpmsiTable 1 }

     MvpnSpmsiEntry ::= SEQUENCE {
        mvpnSpmsiCmcastAddrType        InetAddressType,
        mvpnSpmsiCmcastGroup           InetAddress,
        mvpnSpmsiCmcastGroupPrefixLen  Unsigned32,
        mvpnSpmsiCmcastSource          InetAddress,
        mvpnSpmsiCmcastSourcePrefixLen Unsigned32,
        mvpnSpmsiOrigAddrType          InetAddressType,
        mvpnSpmsiOrigAddress           InetAddress,
        mvpnSpmsiTunnelAttribute       RowPointer,
        mvpnSpmsiUpTime                TimeInterval,
        mvpnSpmsiExpTime               TimeInterval,
        mvpnSpmsiRefCnt                Unsigned32
        }
```

```
     mvpnSpmsiCmcastAddrType OBJECT-TYPE
        SYNTAX        InetAddressType
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The Internet address type of mvpnSpmsiCmcastGroup/Source."
        ::= { mvpnSpmsiEntry 1 }

     mvpnSpmsiCmcastGroup OBJECT-TYPE
        SYNTAX        InetAddress
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "S-PMSI C-multicast group address.
             If it is 0 (or ::0), this is a wildcard group,
             and mvpnSpmsiCmcastGroupPrefixLen must be 32 (or 128)."
        ::= { mvpnSpmsiEntry 2 }

     mvpnSpmsiCmcastGroupPrefixLen OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "S-PMSI C-multicast group address prefix length."
        ::= { mvpnSpmsiEntry 3 }

     mvpnSpmsiCmcastSource OBJECT-TYPE
        SYNTAX        InetAddress
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "S-PMSI C-multicast source address
             If it is 0 (or ::0), this is a wildcard source,
             and mvpnSpmsiCmcastSourcePrefixLen must be 32 (or 128)."
        ::= { mvpnSpmsiEntry 4 }

     mvpnSpmsiCmcastSourcePrefixLen OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "S-PMSI C-multicast source address prefix length."
        ::= { mvpnSpmsiEntry 5 }

     mvpnSpmsiOrigAddrType OBJECT-TYPE
        SYNTAX        InetAddressType
        MAX-ACCESS    not-accessible
        STATUS        current
```

```
        DESCRIPTION
            "The Internet address type of mvpnSpmsiOrigAddress."
        ::= { mvpnSpmsiEntry 6 }

     mvpnSpmsiOrigAddress OBJECT-TYPE
        SYNTAX        InetAddress
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The BGP address of the device that originated the S-PMSI."
        ::= { mvpnSpmsiEntry 7 }

     mvpnSpmsiTunnelAttribute OBJECT-TYPE
        SYNTAX        RowPointer
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "A row pointer to the l2L3VpnMcastPmsiTunnelAttributeTable"
        ::= { mvpnSpmsiEntry 8 }

     mvpnSpmsiUpTime OBJECT-TYPE
        SYNTAX        TimeInterval
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The time since this S-PMSI
             was first advertised/received by the device."
        ::= { mvpnSpmsiEntry 9 }

     mvpnSpmsiExpTime OBJECT-TYPE
        SYNTAX        TimeInterval
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
             "For UDP-based S-PMSI signaling for PIM-MVPN,
             the amount of time remaining before this
             received S-PMSI Join Message expires,
             or the next S-PMSI Join Message refresh is to be
             advertised again from the device.
             Otherwise, it is 0."
        ::= { mvpnSpmsiEntry 10 }

     mvpnSpmsiRefCnt OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The number of c-multicast routes that are mapped to
```

```
             this S-PMSI."
         ::= { mvpnSpmsiEntry 11 }

     -- Table of multicast routes in an MVPN

     mvpnMrouteTable OBJECT-TYPE
        SYNTAX        SEQUENCE OF MvpnMrouteEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
               "This table augments ipMcastRouteTable, to provide some MVPN
                specific information."
        ::= { mvpnStates 4 }

     mvpnMrouteEntry OBJECT-TYPE
        SYNTAX        MvpnMrouteEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
            "The mvpnMrouteEntry matches and augments an ipMcastRouteEntry,
             with MVPN specific information, such as PMSI used."
        AUGMENTS      { ipMcastRouteEntry }
           ::= { mvpnMrouteTable 1 }

     MvpnMrouteEntry ::= SEQUENCE {
        mvpnMroutePmsiPointer               RowPointer,
        mvpnMrouteNumberOfLocalReplication  Unsigned32,
        mvpnMrouteNumberOfRemoteReplication Unsigned32,
        mvpnMrouteDataRate                  Unsigned32
        }

     mvpnMroutePmsiPointer OBJECT-TYPE
        SYNTAX        RowPointer
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The I-PMSI or S-PMSI this C-multicast route is using.
             This is important because an implementation may not have an
             interface corresponding to a provider tunnel,
             that can be used in ipMcastRouteNextHopEntry."
        ::= { mvpnMrouteEntry 1 }

     mvpnMrouteNumberOfLocalReplication OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "Number of replications to local receivers."
```

```
        ::= { mvpnMrouteEntry 2 }

     mvpnMrouteNumberOfRemoteReplication OBJECT-TYPE
        SYNTAX        Unsigned32
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "Number of (local) replications to remote receivers."
        ::= { mvpnMrouteEntry 3 }

     mvpnMrouteDataRate OBJECT-TYPE
        SYNTAX        Unsigned32  (0..4294967295)
        UNITS         "kilobits per second"
        MAX-ACCESS    read-only
        STATUS        current
        DESCRIPTION
            "The data rate for traffic following this route."
        ::= { mvpnMrouteEntry 4 }

     -- MVPN Notifications

     mvpnMvrfChange NOTIFICATION-TYPE
        OBJECTS     {
                      mvpnGenOperStatusChange
                    }
        STATUS      current
        DESCRIPTION
            "A mvpnMvrfChange notification signifies a change about
             a MVRF in the device. The change event can be creation of
             the MVRF, deletion of the MVRF or an update on the I-PMSI
             or S-PMSI configuration of the MVRF. The change event
             is indicated by mvpnGenOperStatusChange embedded in
             the notification. The user can then query
             mvpnGeneralTable, and/or mvpnSpmsiConfigTable to
             get the details of the change as necessary.

             Note: Since the creation of a MVRF is often followed by
             configuration of I-PMSI and/or S-PMSIs for the MVRF,
             more than one (three at most) notifications for a MVRF may
             be generated serially, and it is really not necessary to
             generate all three of them. An agent may choose to generate a
             notification for the last event only, that is for S-PMSI
             configuration.

             Similarly, deletion of I-PMSI and S-PMSI configuration on a
             MVRF happens before a MVRF is deleted and it is recommended
             that the agent send the notification for MVRF deletion
             event only."
```

```
        ::= { mvpnNotifications 2 }

     -- MVPN MIB Conformance Information

     mvpnGroups      OBJECT IDENTIFIER ::= { mvpnConformance 1 }
     mvpnCompliances OBJECT IDENTIFIER ::= { mvpnConformance 2 }

     -- Compliance Statements

         mvpnCompliance MODULE-COMPLIANCE
             STATUS  current
             DESCRIPTION
                "The compliance statement "
            MODULE  -- this module
            MANDATORY-GROUPS {
                mvpnScalarGroup,
                mvpnGeneralGroup,
                mvpnSpmsiConfigGroup,
                mvpnSpmsiGroup,
                mvpnMrouteGroup
                }

            GROUP mvpnIpmsiGroup
                DESCRIPTION
                    "This group is mandatory for systems that support
                     BGP signaling for I-PMSI."

            GROUP mvpnInterAsIpmsiGroup
                DESCRIPTION
                    "This group is mandatory for systems that support
                     Inter-AS Segmented I-PMSI."

            GROUP mvpnBgpGeneralGroup
                DESCRIPTION
                    "This group is mandatory for systems that support
                     BGP-MVPN."

            ::= { mvpnCompliances 1 }


     -- units of conformance

         mvpnScalarGroup    OBJECT-GROUP
             OBJECTS {
                 mvpnMvrfNumber,
                 mvpnMvrfNumberV4,
                 mvpnMvrfNumberV6,
                 mvpnMvrfNumberPimV4,
```

```
                mvpnMvrfNumberPimV6,
                mvpnMvrfNumberBgpV4,
                mvpnMvrfNumberBgpV6,
                mvpnMvrfNumberMldp,
                mvpnNotificationEnable
                }
            STATUS      current
            DESCRIPTION
               "These objects are used to monitor/manage
               global MVPN parameters."
            ::= { mvpnGroups 1 }

        mvpnGeneralGroup    OBJECT-GROUP
            OBJECTS {
                mvpnGenOperStatusChange,
                mvpnGenOperChangeTime,
                mvpnGenCmcastRouteProtocolV4,
                mvpnGenCmcastRouteProtocolV6,
                mvpnGenIpmsiConfigV4,
                mvpnGenIpmsiConfigV6,
                mvpnGenInterAsPmsiConfigV4,
                mvpnGenInterAsPmsiConfigV6,
                mvpnGenRowStatus
                }
            STATUS      current
            DESCRIPTION
               "These objects are used to monitor/manage
                per-VRF MVPN parameters."
            ::= { mvpnGroups 2 }

        mvpnPmsiConfigGroup    OBJECT-GROUP
            OBJECTS {
                mvpnPmsiConfigEncapsType,
                mvpnPmsiConfigRowStatus
                }
            STATUS      current
            DESCRIPTION
               "These objects are used to monitor/manage
                PMSI tunnel configurations."
            ::= { mvpnGroups 3 }

        mvpnSpmsiConfigGroup    OBJECT-GROUP
            OBJECTS {
                mvpnSpmsiConfigThreshold,
                mvpnSpmsiConfigPmsiPointer,
                mvpnSpmsiConfigRowStatus
                }
            STATUS      current
```

```
            DESCRIPTION
               "These objects are used to monitor/manage
                S-PMSI configurations."
            ::= { mvpnGroups 4 }

        mvpnIpmsiGroup    OBJECT-GROUP
            OBJECTS {
                mvpnIpmsiUpTime,
                mvpnIpmsiAttribute
                }
            STATUS      current
            DESCRIPTION
               "These objects are used to monitor/manage
                Intra-AS I-PMSI attributes."
            ::= { mvpnGroups 5 }

        mvpnInterAsIpmsiGroup    OBJECT-GROUP
            OBJECTS {
                mvpnInterAsIpmsiAttribute
                }
            STATUS      current
            DESCRIPTION
               "These objects are used to monitor/manage
                Inter-AS I-PMSI attributes."
            ::= { mvpnGroups 6 }

        mvpnSpmsiGroup    OBJECT-GROUP
            OBJECTS {
                mvpnSpmsiTunnelAttribute,
                mvpnSpmsiUpTime,
                mvpnSpmsiExpTime,
                mvpnSpmsiRefCnt
                }
            STATUS      current
            DESCRIPTION
               "These objects are used to monitor/manage
                S-PMSI attributes."
            ::= { mvpnGroups 7 }

        mvpnMrouteGroup    OBJECT-GROUP
            OBJECTS {
                mvpnMrouteNumberOfLocalReplication,
                mvpnMrouteNumberOfRemoteReplication,
                mvpnMrouteDataRate
                }
            STATUS      current
            DESCRIPTION
               "These objects are used to monitor/manage
```

```
                VPN multicast forwarding states."
            ::= { mvpnGroups 8 }

        mvpnBgpGeneralGroup    OBJECT-GROUP
            OBJECTS {
                mvpnBgpGenMode,
                mvpnBgpGenUmhSelection,
                mvpnBgpGenSiteType,
                mvpnBgpGenCmcastImportRt,
                mvpnBgpGenSrcAs,
                mvpnBgpGenSptnlLimit
                }
            STATUS      current
            DESCRIPTION
               "These objects are used to monitor/manage BGP-MVPN "
            ::= { mvpnGroups 9 }

        mvpnOptionalGroup OBJECT-GROUP
            OBJECTS {
                mvpnMroutePmsiPointer
            }
            STATUS      current
            DESCRIPTION
                "Support of these object is not required."
            ::= { mvpnGroups 10}

    END
```

3 Security Considerations

<Security considerations text>

4 IANA Considerations

<IANA considerations text>

5 Acknowledgement

Some of the text has been taken almost verbatim from [CISCO-MIB].

We would like to thank Yakov Rekhter, Jeffrey Haas, Huajin Jeng, Durga Prasad Velamuri for their helpful comments.

6 References

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