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.

Status of this Memo

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MPLS/BGP Layer 3 VPN Multicast Management Information Base

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Jeffrey Zhang Expires 2014-04-12

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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 particular 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      | -> |   MvpnPmsiConfig  | <- | MvpnSpmsiConfig |
+--------------+    +-------------------+    +-----------------+
+--------------+    +-------------------+    +-----------------+
| MvpnGeneral  |   | L2L3VpnMcastPmsi  | <- |    MvpnSpmsi    |
+--------------+    +-------------------+    +-----------------+
+--------------+    +-------------------+    +-----------------+
|  MvpnIpmsi   |   |    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/Entry

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)
                        }
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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 information."
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)
    ucast-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

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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

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"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
}
mvnpSpmsiCmcastAddrType  OBJECT-TYPE
SYNTAX     InetAddressType
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
   "The Internet address type of mvnpSpmsiCmcastGroup/Source."
::= { mvnpSpmsiEntry 1 }

mvnpSpmsiCmcastGroup  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 mvnpSpmsiCmcastGroupPrefixLen must be 32 (or 128)."
::= { mvnpSpmsiEntry 2 }

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

mvnpSpmsiCmcastSource  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 mvnpSpmsiCmcastSourcePrefixLen must be 32 (or 128)."
::= { mvnpSpmsiEntry 4 }

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

mvnpSpmsiOrigAddrType  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,
   mvpnSpmsiRefCount
}
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].

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6 References

6.1 Normative References
6.2 Informative References


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