MPLS/BGP Layer 3 VPN Multicast
Management Information Base

draft-ietf-bess-mvpn-mib-02

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 IP VPNs (MVPN) on a router.

Status of this Memo

This Internet-Draft is submitted to IETF in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at http://www.ietf.org/1id-abstracts.html

The list of Internet-Draft Shadow Directories can be accessed at http://www.ietf.org/shadow.html
Copyright and License Notice

Copyright (c) 2016 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust’s Legal Provisions Relating to IETF Documents (http://trustee.ietf.org/license-info) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1 Introduction .................................................. 3
  1.1 Terminology ................................................. 3
2 MVPN MIB ...................................................... 3
  2.1 Summary of MIB Module ................................. 3
  2.2 MIB Module Definitions ............................... 5
3 Security Considerations ................................. 29
4 IANA Considerations ........................................ 29
5 Acknowledgement ............................................ 29
6 References .................................................... 30
  6.1 Normative References ................................. 30
  6.2 Informative References .............................. 30
Authors’ Addresses ............................................. 30
1 Introduction

Multicast in MPLS/BGP IP VPNs (MVPN) is specified in [MVPN], [BGP-MVPN] and [MVPN-WILDCARD]. 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 PIM being used for exchanging C-multicast states, and "BGP-MVPN" to refer to BGP being 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 BESS WG at bess@ietf.org.

1.1 Terminology

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 Multicast VRF (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-MVRF's information, including the configuration, status and operational details, such as different P-Multicast Service Interfaces (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 |
| General      |    +-------------------+    +-----------------+
+--------------+    +-------------------+    +-----------------+

+--------------+    +-------------------+    +-----------------+
| MvpnGeneral  | -> | L2L3VpnMcastPmsi  | <- | MvpnSpmsi       |
+--------------+    +-------------------+    +-----------------+

+--------------+    +-------------------+
| MvpnInterAs  |    |    MvpnMroute     |
| Ipmsi        |    +-------------------+
+--------------+
```

- mvpnGeneralTable

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

Existence of the corresponding VRF in [L3VPN-MIB] is necessary for a row to exist in this table.

- mvpnBgpGeneralTable

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

- mvpnSpmsiConfigTable

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

- mvpnPmsiConfigTable

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

- mvpnIpmsiTable

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

- mvpnInterAsIpmsiTable

This table contains all advertised and 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.

- 12L3VpnMcastPmsiTunnelAttributeTable

This table is defined separately in 12L3VpnMcastMIB [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

This table augments ipMcastMIB.ipMcast.ipMcastRouteTable [MROUTE-
MIB], 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 "201405071200Z"  -- 07 May 2014 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 bess@ietf.org"

DESCRIPTION
"This MIB contains managed object definitions for
multicast in BGP/MPLS IP VPNs defined by [MVPN].
Copyright (C) The Internet Society (2016)."

-- Revision history.
REVISION "201405071200Z"  -- 07 May 2014 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 total number of MVRFs that are present on this device, whether for IPv4, IPv6, or mLDP C-Multicast."
 ::= { 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 each MVRF in the device."
 INDEX { mplsL3VpnVrfName, mvpnGenAddressFamily }
 ::= { mvpnGeneralTable 1 }

MvpnGeneralEntry ::= SEQUENCE {
 mvpnGenAddressFamily       INTEGER,
 mvpnGenOperStatusChange    INTEGER,
 mvpnGenOperChangeTime      TimeStamp,
 mvpnGenCmcastRouteProtocol INTEGER,
 mvpnGenIpmsiConfig         RowPointer,
 mvpnGenInterAsPmsiConfig   RowPointer,
 mvpnGenUmhSelection        INTEGER,
 mvpnGenSiteType            INTEGER,
 mvpnGenSptnlLimit          Unsigned32,
 mvpnGenRowStatus           RowStatus
 }

mvpnGenAddressFamily OBJECT-TYPE
 SYNTAX INTEGER { ipv4(1), ipv6(2) }
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "The Address Fammily that this entry is for"
 ::= { mvpnGeneralEntry 1 }

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 2 }

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 3 }

mvpnGenCmcastRouteProtocol OBJECT-TYPE
SYNTAX        INTEGER { pim (1),
                             bgp (2) }
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION
"The protocol used to signal C-multicast states across the provider core.
  pim(1): PIM (PIM-MVPN).
  bgp(2): BGP (BGP-MVPN)."
::= { mvpnGeneralEntry 4 }

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

mvpnGenInterAsPmsiConfig OBJECT-TYPE
SYNTAX RowPointer
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"This points to a row in mvpnPmsiConfigTable,
for inter-as I-PMSI configuration, in case of segmented
inter-as provider tunnels."
::= { mvpnGeneralEntry 6 }

mvpnGenUmhSelection 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"
::= { mvpnGeneralEntry 7 }

mvpnGenSiteType   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."
::= { mvpnGeneralEntry 8 }

mvpnGenSptnlLimit OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS           read-write
STATUS                current
DESCRIPTION
    "The max number of selective provider tunnels this device
    allows for this mvpn."
::= { mvpnGeneralEntry 9}

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 10 }

-- 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,
    mvpnBgpGenVrfRtImport    MplsL3VpnRouteDistinguisher,
    mvpnBgpGenSrcAs          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): inter-site shared tree mode
  spt-only(2): inter-site source-only tree mode."
 ::= { mvpnBgpGeneralEntry 1}

mvpnBgpGenVrfRtImport OBJECT-TYPE
SYNTAX MplsL3VpnRouteDistinguisher
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"The VRF Route Import Extended Community that this device
adds to unicast vpn routes that it advertises for this mvpn."
 ::= { mvpnBgpGeneralEntry 2}

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 3}

-- 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 }

Zhachui Zhang          Expires September 15, 2016              [Page 14]
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
This table specifies S-PMSI configuration.

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 }

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
INTERNET DRAFT L3VPN Multicast MIB March 14, 2016

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 12L3VpnMcastPmsiTunnelAttributeTable."
::= { 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 each 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 OBJECT-TYPE
SYNTAX 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
}

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 for local receivers. For example, if an ingress PE needs to send traffic out of N PE-CE interfaces, then mvpnMrouteNumberOfLocalReplication is N."
 ::= { mvpnMrouteEntry 2 }

mvpnMrouteNumberOfRemoteReplication OBJECT-TYPE
SYNTAX        Unsigned32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
 "Number of local replications for remote PEs. For example, if the number of remote PEs that need to receive traffic is N, then mvpnMrouteNumberOfRemoteReplication is N in case of Ingress Replication, but may be less than N in case of RSVP-TE or mLDP P2MP tunnels, depending on the actual number of replications the PE needs to do."
 ::= { mvpnMrouteEntry 3 }

-- 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,
    mvpnGenCmcastRouteProtocol,
    mvpnGenIpmsiConfig,
    mvpnGenInterAsPmsiConfig,
    mvpnGenUmhSelection,
    mvpnGenSiteType,
    mvpnGenSptnlLimit,
    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 }

Zhao Hui Zhang          Expires September 15, 2016              [Page 27]
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 {

Zhachui Zhang Expires September 15, 2016 [Page 28]
mvpnMrouteNumberOfLocalReplication,
mvpnMrouteNumberOfRemoteReplication
}
STATUS current
DESCRIPTION
"These objects are used to monitor/manage
VPN multicast forwarding states."
 ::= { mvpnGroups 8 }

mvpnBgpGeneralGroup OBJECT-GROUP
OBJECTS {
  mvpnBgpGenMode,
  mvpnBgpGenVrfRtImport,
  mvpnBgpGenSrcAs
}
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

This MIB contains some read-only objects that may be deemed sensitive
by some though perhaps not all operators. It also contains some read-
write objects, whose setting will change the device’s behavior related
to MVPN. Appropriate security procedures related to SNMP in general
but not specific to this MIB need to be implemented by concerned
operators.

4 IANA Considerations

IANA is requested to root MIB objects in the MIB module contained in
this document under the mib-2 subtree.

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

6.1 Normative References


6.2 Informative References


Authors’ Addresses

Zhaohui Zhang (Editor)
Juniper Networks, Inc.
10 Technology Park Drive
Westford, MA 01886
USA
Email: zzhang@juniper.net

Saud Asif
AT&T
C5-3D30
200 South Laurel Avenue
Middletown, NJ 07748
USA
Email: sasif@att.com

Andy Green
BT Design 21CN Converged Core IP & Data
01473 629360
Adastral Park, Martlesham Heath, Ipswich IP5 3RE
UK
Email: andy.da.green@bt.com

Sameer Gulrajani
Cisco Systems
Tasman Drive
San Jose, CA  95134
USA
EMail: sameerg@cisco.com

Pradeep G. Jain
Alcatel-Lucent Inc
701 E Middlefield road
Mountain view, CA 94043
USA
Email: pradeep.jain@alcatel-lucent.com