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Z. Zhang
Juniper Networks, Inc.
H. Tsunoda
Tohoku Institute of Technology
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L2L3 VPN Multicast MIB
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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes two MIB modules which will be used by other MIB modules for monitoring and/or configuring Layer 2 and Layer 3 Virtual Private Networks that support multicast.

Status of This Memo

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[1.](#) Introduction

In BGP/MPLS Virtual Private Networks (VPNs), Border Gateway Protocol (BGP) is used for distributing routes and MultiProtocol Label Switching (MPLS) is used for forwarding packets accross service provider networks.

The procedures for supporting multicast in BGP/MPLS Layer 3 (L3) VPN are specified in [\[RFC6513\]](#). The procedures for supporting multicast in BGP/MPLS Layer 2 (L2) VPN are specified in [\[RFC7117\]](#). Throughout this document, we will use the term "L2L3VpnMCast network" to mean BGP/MPLS L2 and L3 VPN that support multicast.

L2L3VpnMCast networks use various transport mechanisms for forwarding a packet to all or a subset of Provider Edge routers (PEs) across service provider networks. These transport mechanisms are abstracted as provider tunnels (P-tunnels). The type of a P-tunnel indicates the type of the tunneling technology used to establish the P-tunnel. The syntax and semantics of a Tunnel identifier is determined by the corresponding P-tunnel type [\[RFC6514\]](#). P-tunnel type and P-tunnel identifier together identify a P-tunnel.

A BGP attribute that specifies information of a P-tunnel is called Provider Multicast Service Interface (PMSI) tunnel attribute. The PMSI tunnel attribute is advertised/received by PEs in BGP auto-discovery (A-D) routes. [\[RFC6514\]](#) defines the format of a PMSI tunnel attribute. P-tunnel type and the P-tunnel identifier are included in the corresponding PMSI tunnel attribute.

This document describes textual conventions (TCs) and common managed objects (MOs) which will be used by other Management Information Base (MIB) modules for monitoring and/or configuring L2L3VpnMCast networks.

This document defines two TCs to represent

- (a) the type of a P-tunnel and
- (b) the identifier of a P-tunnel

respectively.

The document also defines MOs that will provide the information contained in a PMSI tunnel attribute and corresponding P-tunnel information.

1.1. Terminology

This document adopts the definitions, acronyms and mechanisms described in [\[RFC6513\]](#) [\[RFC6514\]](#) [\[RFC7117\]](#) and other documents that they refer to. Familiarity with Multicast, MPLS, Layer 3 VPN, Multicast VPN concepts and/or mechanisms is assumed. Some terms specifically related to this document are explained below.

"Provider Multicast Service Interface (PMSI)" [\[RFC6513\]](#) is a conceptual interface instantiated by a P-tunnel, a transport mechanism used to deliver multicast traffic. A PE uses it to send customer multicast traffic to all or some PEs in the same VPN.

There are two kinds of PMSIs: "Inclusive PMSI (I-PMSI)" and "Selective PMSI (S-PMSI)" [\[RFC6513\]](#). An I-PMSI is a PMSI that enables a PE attached to a particular Multicast VPN to transmit a message to all PEs in the same VPN. An S-PMSI is a PMSI that enables a PE attached to a particular Multicast VPN to transmit a message to some of the PEs in the same VPN.

Throughout this document, we will use the term "PMSI" to refer both "I-PMSI" and "S-PMSI."

The key words "MUST", "SHOULD", "RECOMMENDED", and "MAY" in this document are to be interpreted as described in [\[RFC2119\]](#).

2. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to [section 7 of RFC 3410](#) [\[RFC3410\]](#).

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].

3. Summary of MIB Modules

This document defines two MIB modules: L2L3-VPN-MCAST-TC-MIB and L2L3-VPN-MCAST-MIB.

- o L2L3-VPN-MCAST-TC-MIB contains two Textual Conventions: L2L3VpnMcastProviderTunnelType and L2L3VpnMcastProviderTunnelId. L2L3VpnMcastProviderTunnelType provides an enumeration of the P-tunnel types. L2L3VpnMcastProviderTunnelId represents an identifier of a P-tunnel.
- o L2L3-VPN-MCAST-MIB defines a table l2L3VpnMcastPmsiTunnelAttributeTable. An entry in this table corresponds to the attribute information of a specific P-tunnel on a PE router. Entries in this table will be used by other MIB modules for monitoring and/or configuring L2L3VpnMcast network. The table index uniquely identifies a P-tunnel. It is composed of a type and identifier of a P-tunnel. The table may also be used in conjunction with other MIBs, such as MPLS Traffic Engineering MIB (MPLS-TE-STD-MIB) [[RFC3812](#)], to obtain further information about a P-tunnel. It may also be used in conjunction with the Interfaces Group MIB (IF-MIB) [[RFC2863](#)] to obtain further information about the interface corresponding to a P-tunnel.

4. Definitions

4.1. L2L3-VPN-MCAST-TC-MIB Object Definitions

```
L2L3-VPN-MCAST-TC-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, mib-2
```

```
    FROM SNMPv2-SMI -- [RFC2578]
```

```
    TEXTUAL-CONVENTION
```

```
    FROM SNMPv2-TC; -- [RFC2579]
```

```
l2L3VpnMcastTCMIB MODULE-IDENTITY
```

```
    LAST-UPDATED "201711071200Z" -- 7th November, 2017
```


ORGANIZATION "IETF BESS Working Group."

CONTACT-INFO

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

Hiroshi Tsunoda
Tohoku Institute of Technology
35-1, Yagiyama Kasumi-cho
Taihaku-ku, Sendai, 982-8577
Japan
Email: tsuno@m.ieice.org

Comments and discussion to bess@ietf.org

"

DESCRIPTION

"This MIB module specifies textual conventions for
Border Gateway Protocol/MultiProtocol Label
Switching Layer 2 and Layer 3 Virtual Private Networks
that support multicast (L2L3VpnMCast networks).

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"

-- Revision history.

REVISION "201711071200Z" -- 7th November, 2017

DESCRIPTION

"Initial version, published as RFC XXXX."

-- RFC Ed.: replace XXXX with actual RFC number and remove this note

::= { mib-2 AAAA }

-- IANA Reg.: Please assign a value for "AAAA" under the
-- 'mib-2' subtree and record the assignment in the SMI
-- Numbers registry.

-- RFC Ed.: When the above assignment has been made, please
-- remove the above note
-- replace "AAAA" here with the assigned value and
-- remove this note.

-- Textual convention

L2L3VpnMcastProviderTunnelType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"This textual convention enumerates values representing the type of a provider tunnel (P-tunnel) used for L2L3VpnMCast networks. These labeled numbers are aligned with the definition of Tunnel types in [Section 5 of \[RFC6514\]](#) and [Section 14.1 of \[RFC7524\]](#).

The enumerated values and the corresponding P-tunnel types are as follows:

noTunnelInfo	(0) : no tunnel information present	[RFC6514]
rsvpP2mp	(1) : RSVP-TE P2MP LSP	[RFC4875]
ldpP2mp	(2) : mLDP P2MP LSP	[RFC6388]
pimSsm	(3) : PIM-SSM Tree	[RFC7761]
pimAsm	(4) : PIM-SM Tree	[RFC7761]
pimBidir	(5) : BIDIR-PIM Tree	[RFC5015]
ingressReplication	(6) : Ingress Replication	[RFC6513]
ldpMp2mp	(7) : mLDP MP2MP LSP	[RFC6388]
transportTunnel	(8) : Transport Tunnel	[RFC7524]

These numbers are registered at IANA.

A current list of assignments can be found at

<<https://www.iana.org/assignments/bgp-parameters/bgp-parameters.xhtml#pmsi-tunnel-types>>.

"

REFERENCE

"[RFC4875](#)
[RFC5015](#)
[RFC6388](#)
[RFC6513](#)
[RFC6514, Section 5](#)
[RFC7385](#)
[RFC7524, Section 14.1](#)
[RFC7761](#)

"


```

SYNTAX      INTEGER
{
    noTunnelInfo      (0),
    rsvpP2mp          (1),
    ldpP2mp           (2),
    pimSsm             (3),
    pimAsm             (4),
    pimBidir           (5),
    ingressReplication (6),
    ldpMp2mp           (7),
    transportTunnel    (8)
}

```

L2L3VpnMcastProviderTunnelId ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"This textual convention represents the tunnel identifier of a P-tunnel.

The size of the identifier depends on the address family (IPv4 or IPv6) and the value of the corresponding L2L3VpnMcastProviderTunnelType object.

The corresponding L2L3VpnMcastProviderTunnelType object represents the type of the tunneling technology used to establish the P-tunnel.

The size of the identifier for each tunneling technology is summarized below.

L2L3VpnMcastProviderTunnelType (tunneling technology)		Size (in octets)	
		IPv4	IPv6
noTunnelInfo	(No tunnel information)	0	0
rsvpP2mp	(RSVP-TE P2MP LSP)	12	24
ldpP2mp	(mLDP P2MP LSP)	17	29
pimSsm	(PIM-SSM Tree)	8	32
pimAsm	(PIM-SM Tree)	8	32
pimBidir	(BIDIR-PIM Tree)	8	32
ingressReplication	(Ingress Replication)	4	16
ldpMp2mp	(mLDP MP2MP LSP)	17	29
transportTunnel	(Transport Tunnel)	8	32

Tunnel type is set to 'No tunnel information present' when the PMSI Tunnel attribute carries no tunnel information (there is no Tunnel Identifier).

The value of the corresponding L2L3VpnMcastProviderTunnelId object will be a string of length zero.

For tunnel type rsvpP2mp(1), the corresponding Tunnel Identifier is composed of Extended Tunnel ID (4 octets in IPv4, 16 octets in IPv6), Reserved (2 octets), Tunnel ID (2 octets), and P2MP ID (4 octets).

The size of the corresponding L2L3VpnMcastProviderTunnelId object will be 12 octets in IPv4 and 24 octets in IPv6.

For tunnel type ldpP2mp(2), the corresponding Tunnel Identifier is the P2MP Forwarding Equivalence Class (FEC) Element [[RFC6388](#)]. The size of the corresponding L2L3VpnMcastProviderTunnelId object will be 17 octets in IPv4 and 29 octets in IPv6.

For tunnel type pimSsm(3), PimAsm(4), and PimBidir(5), the corresponding Tunnel Identifier is composed of the source IP address and the group IP address.

The size of the corresponding L2L3VpnMcastProviderTunnelId object will be 8 octets in IPv4 and 32 octets in IPv6.

For tunnel type ingressReplication(6), the Tunnel Identifier is the unicast tunnel endpoint IP address of the local PE.

The size of the corresponding L2L3VpnMcastProviderTunnelId object will be 4 octets in IPv4 and 16 octets in IPv6.

For tunnel type ldpMp2mp(7), the Tunnel Identifier is MP2MP FEC Element [[RFC6388](#)].

The size of the corresponding L2L3VpnMcastProviderTunnelId object will be 17 octets in IPv4 and 29 octets in IPv6.

For tunnel type transportTunnel(8), the Tunnel Identifier is a tuple of Source PE Address and Local Number, which is a number that is unique to the Source PE [[RFC7524](#)]. Both Source PE Address and Local Number are 4 octets in IPv4 and 16 octets in IPv6.

The size of the corresponding L2L3VpnMcastProviderTunnelId object will be 8 octets in IPv4 and 32 octets in IPv6.

"

REFERENCE

"[RFC6514, Section 5](#)
[RFC4875, Section 19.1](#)
[RFC6388, Section 2.2](#) and 3.2
[RFC7524, Section 14.1](#)

"

SYNTAX OCTET STRING (SIZE (0|4|8|12|16|17|24|29|32))

END

4.2. L2L3-VPN-MCAST-MIB Object Definitions

```
L2L3-VPN-MCAST-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, mib-2, zeroDotZero
        FROM SNMPv2-SMI                    -- [RFC2578]
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF                    -- [RFC2580]
    RowPointer
        FROM SNMPv2-TC                      -- [RFC2579]
    MplsLabel
        FROM MPLS-TC-STD-MIB                -- [RFC3811]
    L2L3VpnMcastProviderTunnelType,
    L2L3VpnMcastProviderTunnelId
        FROM L2L3-VPN-MCAST-TC-MIB;        -- [RFCXXXX]

-- RFC Ed.: replace XXXX with actual RFC number and remove this note

l2l3VpnMcastMIB MODULE-IDENTITY
    LAST-UPDATED "201712121200Z" -- 12th December, 2017
    ORGANIZATION "IETF BESS Working Group."
    CONTACT-INFO
        "
            Zhaohui Zhang
            Juniper Networks, Inc.
            10 Technology Park Drive
            Westford, MA 01886
            USA
            Email: zzhang@juniper.net

            Hiroshi Tsunoda
            Tohoku Institute of Technology
            35-1, Yagiyama Kasumi-cho
            Taihaku-ku, Sendai, 982-8577
            Japan
            Email: tsuno@m.ieice.org

            Comments and discussion to bess@ietf.org
        "
```


DESCRIPTION

"This MIB module defines a table representing the attribute information of the provider tunnels (P-tunnels) on a PE router. This MIB module will be used by other MIB modules designed for monitoring and/or configuring Border Gateway Protocol/MultiProtocol Label Switching Layer 2 and Layer 3 Virtual Private Network that support multicast (L2L3VpnMcast network). Copyright (C) The Internet Society (2017)."

-- Revision history.

REVISION "201712121200Z" -- 12th December, 2017

DESCRIPTION

"Initial version, published as RFC XXXX."

-- RFC Ed.: replace XXXX with actual RFC number and remove this note

::= { mib-2 BBBB }

-- IANA Reg.: Please assign a value for "BBBB" under the
-- 'mib-2' subtree and record the assignment in the SMI
-- Numbers registry.

-- RFC Ed.: When the above assignment has been made, please
-- remove the above note
-- replace "BBBB" here with the assigned value and
-- remove this note.

-- Top level components of this MIB.

l2L3VpnMcastStates OBJECT IDENTIFIER
::= { l2L3VpnMcastMIB 1 }

l2L3VpnMcastConformance OBJECT IDENTIFIER
::= { l2L3VpnMcastMIB 2 }

-- tables, scalars, conformance information
-- Table of PMSI Tunnel Attributes

l2L3VpnMcastPmsiTunnelAttributeTable OBJECT-TYPE
SYNTAX SEQUENCE OF L2L3VpnMcastPmsiTunnelAttributeEntry
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"An entry in this table corresponds to the attribute information of a specific P-tunnel on a PE router.
 A part of attributes correspond to fields in a Provider Multicast Service Interface (PMSI) Tunnel attribute advertised and received by a PE router.
 The entries will be referred to by other MIB modules for monitoring and/or configuring L2L3VpnMCast networks.
 "

REFERENCE

"[RFC6514, Section 5](#)"

::= { l2L3VpnMcastStates 1 }

l2L3VpnMcastPmsiTunnelAttributeEntry OBJECT-TYPE

SYNTAX L2L3VpnMcastPmsiTunnelAttributeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A conceptual row corresponding to a specific P-tunnel on this router.
 "

REFERENCE

"[RFC6514, Section 5](#)"

INDEX {

l2L3VpnMcastPmsiTunnelAttributeType,
 l2L3VpnMcastPmsiTunnelAttributeId
 }

::= { l2L3VpnMcastPmsiTunnelAttributeTable 1 }

l2L3VpnMcastPmsiTunnelAttributeEntry ::=

SEQUENCE {

l2L3VpnMcastPmsiTunnelAttributeType
 L2L3VpnMcastProviderTunnelType,
 l2L3VpnMcastPmsiTunnelAttributeId
 L2L3VpnMcastProviderTunnelId,
 l2L3VpnMcastPmsiTunnelLeafInfoRequired
 INTEGER,
 l2L3VpnMcastPmsiTunnelAttributeMplsLabel
 MplsLabel,
 l2L3VpnMcastPmsiTunnelPointer
 RowPointer,
 l2L3VpnMcastPmsiTunnelIf
 RowPointer
 }

l2L3VpnMcastPmsiTunnelAttributeType OBJECT-TYPE

SYNTAX L2L3VpnMcastProviderTunnelType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object indicates the type of the tunneling technology used to establish the P-tunnel corresponding to this entry.

When BGP-based PMSI signaling is used, the value of this object corresponds to the Tunnel Type field in the PMSI Tunnel attribute advertised/received in a PMSI auto-discovery (A-D) route.

"

REFERENCE

["RFC6514, Section 5"](#)

::= { l2L3VpnMcastPmsiTunnelAttributeEntry 1 }

l2L3VpnMcastPmsiTunnelAttributeId OBJECT-TYPE

SYNTAX L2L3VpnMcastProviderTunnelId

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This object represents the Tunnel Identifier field, which uniquely identifies a P-tunnel, in the PMSI Tunnel attribute of the P-tunnel corresponding to this entry.

The size of the identifier depends on the address family (IPv4 or IPv6) and the value of the corresponding l2L3VpnMcastPmsiTunnelAttributeType object i.e., the type of the tunneling technology used to establish the P-tunnel.

"

REFERENCE

["RFC6514, Section 5"](#)

::= { l2L3VpnMcastPmsiTunnelAttributeEntry 2 }

l2L3VpnMcastPmsiTunnelLeafInfoRequired OBJECT-TYPE

SYNTAX INTEGER {
false (0),
true (1),
notAvailable (2)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"When the value of this object is set to 1 (true), it indicates that the PE which originated the PMSI Tunnel attribute of the P-tunnel corresponding to this entry requests receivers to originate a new Leaf A-D (Auto-Discovery) route.

A value of 0 (false) indicates that there is no such request.

When the P-tunnel does not have a corresponding PMSI tunnel attribute, the value of this object will be 2 (notAvailable).

In the case of Multicast in MPLS/BGP IP VPNs, this object represents the 'Leaf Information Required flag' [[RFC6514](#)] in the Flags field in the PMSI Tunnel attribute of the P-tunnel corresponding to this entry.

"

REFERENCE

"[RFC6514, Section 5](#)"

"

::= { l2L3VpnMcastPmsiTunnelAttributeEntry 3 }

l2L3VpnMcastPmsiTunnelAttributeMplsLabel OBJECT-TYPE

SYNTAX MplsLabel

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object represents the MPLS Label in the PMSI Tunnel attribute of the P-tunnel corresponding to this entry.

When BGP-based PMSI signaling is used, the PMSI Tunnel attribute of the P-tunnel will be advertised/received in a PMSI auto-discovery (A-D) route. The value of this object corresponds to the MPLS Label in the attribute.

When the P-tunnel does not have a PMSI tunnel attribute, the value of this object will be 0.

"

REFERENCE

"[RFC6514, Section 5](#)"

::= { l2L3VpnMcastPmsiTunnelAttributeEntry 4 }

l2L3VpnMcastPmsiTunnelPointer OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Details of a P-tunnel identified by l2L3VpnMcastPmsiTunnelAttributeId may be present in some other table, e.g., mplsTunnelTable [[RFC3812](#)]. This object specifies the pointer to the row that pertains to the entry in the table.

If no such entry exists, the value of this object will be zeroDotZero.

"

REFERENCE

"[RFC3812, Section 6.1](#) and [Section 11](#)"

DEFVAL { zeroDotZero }

::= { l2L3VpnMcastPmsiTunnelAttributeEntry 5 }

l2L3VpnMcastPmsiTunnelIf OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If the P-tunnel identified by l2L3VpnMcastPmsiTunnelAttributeId has a corresponding entry in ifXTable [[RFC2863](#)], this object will point to the row in ifXTable that pertains to the entry. Otherwise, the value of this object will be zeroDotZero.

"

REFERENCE

"[RFC2863, Section 6](#)"

DEFVAL { zeroDotZero }

::= { l2L3VpnMcastPmsiTunnelAttributeEntry 6 }

-- Conformance Information

l2L3VpnMcastCompliances OBJECT IDENTIFIER

::= { l2L3VpnMcastConformance 1 }

l2L3VpnMcastGroups OBJECT IDENTIFIER

::= { l2L3VpnMcastConformance 2 }

-- Compliance Statements

l2L3VpnMcastCoreCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The core compliance statement for SNMP entities which implement the L2L3-VPN-MCAST-MIB Module."

MODULE -- this module

MANDATORY-GROUPS {
 l2L3VpnMcastCoreGroup

}

::= { l2L3VpnMcastCompliances 1 }


```
l2L3VpnMcastFullCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The full compliance statement for SNMP entities
         which implement the L2L3-VPN-MCAST-MIB Module."
    MODULE -- this module

    MANDATORY-GROUPS {
        l2L3VpnMcastCoreGroup,
        l2L3VpnMcastOptionalGroup
    }
    ::= { l2L3VpnMcastCompliances 2 }

-- units of conformance

l2L3VpnMcastCoreGroup OBJECT-GROUP
    OBJECTS {
        l2L3VpnMcastPmsiTunnelLeafInfoRequired,
        l2L3VpnMcastPmsiTunnelAttributeMplsLabel
    }
    STATUS current
    DESCRIPTION
        "Support of these objects is required."
    ::= { l2L3VpnMcastGroups 1 }

l2L3VpnMcastOptionalGroup OBJECT-GROUP
    OBJECTS {
        l2L3VpnMcastPmsiTunnelPointer,
        l2L3VpnMcastPmsiTunnelIf
    }
    STATUS current
    DESCRIPTION
        "Support of these objects is optional."
    ::= { l2L3VpnMcastGroups 2 }

END
```

5. Security Considerations

There are no management objects defined in these MIB modules that have a MAX-ACCESS clause of read-write and/or read-create. So, if this MIB module is implemented correctly, then there is no risk that an intruder can alter or create any management objects of this MIB module via direct SNMP SET operations.

Some of the readable objects in these MIB modules (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to

control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

- o the l2L3VpnMcastPmsiTunnelAttributeTable collectively shows the P-tunnel network topology and its performance characteristics. For instance, l2L3VpnMcastPmsiTunnelAttributeId in this table will contain the identifier that uniquely identifies a P-tunnel. This identifier may be composed of source and multicast group IP addresses. l2L3VpnMcastPmsiTunnelPointer and l2L3VpnMcastPmsiTunnelIf will point to the corresponding entries in other tables containing configuration and/or performance information of a P-tunnel and its interface. If an Administrator does not want to reveal this information, then these objects should be considered sensitive/vulnerable.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

Implementations SHOULD provide the security features described by the SNMPv3 framework (see [[RFC3410](#)]), and implementations claiming compliance to the SNMPv3 standard MUST include full support for authentication and privacy via the User-based Security Model (USM) [[RFC3414](#)] with the AES cipher algorithm [[RFC3826](#)]. Implementations MAY also provide support for the Transport Security Model (TSM) [[RFC5591](#)] in combination with a secure transport such as SSH [[RFC5592](#)] or TLS/DTLS [[RFC6353](#)].

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

6. IANA Considerations

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

7. References

7.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/[RFC2119](#), March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC2578] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), DOI 10.17487/[RFC2578](#), April 1999, <<https://www.rfc-editor.org/info/rfc2578>>.
- [RFC2579] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), DOI 10.17487/RFC2579, April 1999, <<https://www.rfc-editor.org/info/rfc2579>>.
- [RFC2580] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), DOI 10.17487/RFC2580, April 1999, <<https://www.rfc-editor.org/info/rfc2580>>.
- [RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", [RFC 2863](#), DOI 10.17487/RFC2863, June 2000, <<https://www.rfc-editor.org/info/rfc2863>>.
- [RFC3414] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", STD 62, [RFC 3414](#), DOI 10.17487/[RFC3414](#), December 2002, <<https://www.rfc-editor.org/info/rfc3414>>.
- [RFC3812] Srinivasan, C., Viswanathan, A., and T. Nadeau, "Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)", [RFC 3812](#), DOI 10.17487/RFC3812, June 2004, <<https://www.rfc-editor.org/info/rfc3812>>.
- [RFC3826] Blumenthal, U., Maino, F., and K. McCloghrie, "The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model", [RFC 3826](#), DOI 10.17487/[RFC3826](#), June 2004, <<https://www.rfc-editor.org/info/rfc3826>>.

- [RFC4087] Thaler, D., "IP Tunnel MIB", [RFC 4087](#), DOI 10.17487/[RFC4087](#), June 2005, <<https://www.rfc-editor.org/info/rfc4087>>.
- [RFC4875] Aggarwal, R., Ed., Papadimitriou, D., Ed., and S. Yasukawa, Ed., "Extensions to Resource Reservation Protocol - Traffic Engineering (RSVP-TE) for Point-to-Multipoint TE Label Switched Paths (LSPs)", [RFC 4875](#), DOI 10.17487/RFC4875, May 2007, <<https://www.rfc-editor.org/info/rfc4875>>.
- [RFC5015] Handley, M., Kouvelas, I., Speakman, T., and L. Vicisano, "Bidirectional Protocol Independent Multicast (BIDIR-PIM)", [RFC 5015](#), DOI 10.17487/RFC5015, October 2007, <<https://www.rfc-editor.org/info/rfc5015>>.
- [RFC5591] Harrington, D. and W. Hardaker, "Transport Security Model for the Simple Network Management Protocol (SNMP)", STD 78, [RFC 5591](#), DOI 10.17487/RFC5591, June 2009, <<https://www.rfc-editor.org/info/rfc5591>>.
- [RFC5592] Harrington, D., Salowey, J., and W. Hardaker, "Secure Shell Transport Model for the Simple Network Management Protocol (SNMP)", [RFC 5592](#), DOI 10.17487/RFC5592, June 2009, <<https://www.rfc-editor.org/info/rfc5592>>.
- [RFC6353] Hardaker, W., "Transport Layer Security (TLS) Transport Model for the Simple Network Management Protocol (SNMP)", STD 78, [RFC 6353](#), DOI 10.17487/RFC6353, July 2011, <<https://www.rfc-editor.org/info/rfc6353>>.
- [RFC6388] Wijnands, IJ., Ed., Minei, I., Ed., Kompella, K., and B. Thomas, "Label Distribution Protocol Extensions for Point-to-Multipoint and Multipoint-to-Multipoint Label Switched Paths", [RFC 6388](#), DOI 10.17487/RFC6388, November 2011, <<https://www.rfc-editor.org/info/rfc6388>>.
- [RFC6513] Rosen, E., Ed. and R. Aggarwal, Ed., "Multicast in MPLS/BGP IP VPNs", [RFC 6513](#), DOI 10.17487/RFC6513, February 2012, <<https://www.rfc-editor.org/info/rfc6513>>.
- [RFC6514] Aggarwal, R., Rosen, E., Morin, T., and Y. Rekhter, "BGP Encodings and Procedures for Multicast in MPLS/BGP IP VPNs", [RFC 6514](#), DOI 10.17487/RFC6514, February 2012, <<https://www.rfc-editor.org/info/rfc6514>>.

- [RFC7117] Aggarwal, R., Ed., Kamite, Y., Fang, L., Rekhter, Y., and C. Kodeboniya, "Multicast in Virtual Private LAN Service (VPLS)", [RFC 7117](#), DOI 10.17487/RFC7117, February 2014, <<https://www.rfc-editor.org/info/rfc7117>>.
- [RFC7385] Andersson, L. and G. Swallow, "IANA Registry for P-Multicast Service Interface (PMSI) Tunnel Type Code Points", [RFC 7385](#), DOI 10.17487/RFC7385, October 2014, <<https://www.rfc-editor.org/info/rfc7385>>.
- [RFC7524] Rekhter, Y., Rosen, E., Aggarwal, R., Morin, T., Grosclaude, I., Leymann, N., and S. Saad, "Inter-Area Point-to-Multipoint (P2MP) Segmented Label Switched Paths (LSPs)", [RFC 7524](#), DOI 10.17487/RFC7524, May 2015, <<https://www.rfc-editor.org/info/rfc7524>>.
- [RFC7761] Fenner, B., Handley, M., Holbrook, H., Kouvelas, I., Parekh, R., Zhang, Z., and L. Zheng, "Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised)", STD 83, [RFC 7761](#), DOI 10.17487/RFC7761, March 2016, <<https://www.rfc-editor.org/info/rfc7761>>.
- [RFC7902] Rosen, E. and T. Morin, "Registry and Extensions for P-Multicast Service Interface Tunnel Attribute Flags", [RFC 7902](#), DOI 10.17487/RFC7902, June 2016, <<https://www.rfc-editor.org/info/rfc7902>>.

7.2. Informative References

- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), DOI 10.17487/RFC3410, December 2002, <<https://www.rfc-editor.org/info/rfc3410>>.

Authors' Addresses

Zhaohui (Jeffrey) Zhang
Juniper Networks, Inc.
10 Technology Park Drive
Westford, MA 01886
USA

Email: zzhang@juniper.net

Hiroshi Tsunoda
Tohoku Institute of Technology
35-1, Yagiyama Kasumi-cho
Taihaku-ku, Sendai 982-8577
Japan

Phone: +81-22-305-3411
Email: tsuno@m.ieice.org