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## MPLS/BGP Layer 3 Virtual Private Network Management Information Base

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### 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 Multi-protocol Label Switching Layer-3 Virtual Private Networks on a Multi-Protocol Label Switching (MPLS) Label Switching Router (LSR) supporting this feature.

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## [2.](#) Introduction

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 Multi-protocol Label Switching Layer-3 Virtual Private Networks on a Multi-Protocol Label Switching (MPLS) Label Switching Router (LSR) supporting this feature.

This document adopts the definitions, acronyms and mechanisms described in [\[RFC2547bis\]](#). Unless otherwise stated, the mechanisms of [\[RFC2547bis\]](#) apply and will not be re-described here.

Comments should be made directly to the MPLS mailing list at [mpls@uu.net](mailto:mpls@uu.net) and the Layer-3 VPN (L3VPN) WG at [l3vpn@ietf.org](mailto:l3vpn@ietf.org).

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

### [3.](#) Terminology

This document uses terminology from the document describing the MPLS

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architecture [\[RFC3031\]](#) and from the document describing MPLS Layer-3 VPNs (L3VPN) [\[RFC2547bis\]](#), as well as the MPLS architecture [\[RFC3031\]](#).

Throughout this document, the use of the terms "Provider Edge (PE) and Customer Edge (CE) or PE/CE" will be replaced by PE in all cases except when a network device is a CE when used in the carrier of carriers model.

### [4.](#) 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](#) [\[RFC2580\]](#).

### [5.](#) Assumptions and Prerequisites

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

- MPLS in general, must be configured and operational.
- LDP paths or traffic engineered tunnels [[RFC3812](#)] should be configured between PEs and CEs.

## [6.](#) Brief Description of MIB Objects

The following subsections describe the purpose of each of the objects contained in the MPLS-L3VPN-STD-MIB.

### [6.1](#) mplsL3VpnVrfTable

This table represents the MPLS L3VPNs that are configured. A Network Management System (NMS) or SNMP agent creates an entry in this table for every MPLS L3VPN configured on the LSR being examined. The VRF that is configured at a particular device represents an instance of some VPN, but

not the entire VPN (unless it is the only VRF, of course). The collective set of VRF instances comprises the actual VPN. This information is typically only known in its entirety at the NMS. That is, specific devices generally only know of their local VRF information, but not that of other LSRs' VRFs.

### [6.2](#) mplsL3VpnIfConfTable

This table represents the MPLS L3VPN-enabled interfaces that are associated with a specific VRF as represented in the aforementioned mplsL3VpnVrfTable. Each entry in this table corresponds to an entry in the Interfaces MIB. In addition, each entry extends its corresponding entry in the Interface MIB to contain specific MPLS L3VPN information. Due to this correspondence, certain objects such as traffic counters are not found in this MIB to avoid overlap, but instead are found in the Interfaces MIB [[RFC2863](#)].

### [6.3](#) mplsL3VpnVrfPerfTable

This table contains objects to measure the performance of MPLS L3VPNs and augments the mplsL3VpnVrfTable. High capacity counters are provided for objects that are likely to wrap around quickly on objects such as high-speed interface counters.

### [6.4](#) mplsL3VpnVrfRouteTable

The table contains the objects necessary to configure and monitor routes used by a particular VRF. This includes a cross-connect pointer into the MPLS-LSR-STD-MIB's mplsXCTable, which may be used to refer that entry to its label stack used to label switch that entry.

### [6.5](#) MplsVpnVrfRTTable

The table contains the objects necessary to configure and monitor route targets for a particular VRF.

## [7.](#) Example of MPLS L3VPN Setup

In this section, we provide a brief example of using the MIB objects described in the following section. While this example is not meant to illustrate every nuance of the MIB, it is intended as an aid to understanding some of the key concepts. It is our intent that it is read only after the reader has gone through the MIB itself.

This configuration is under the assumption that 1) MPLS has been pre-configured in the network, through enabling LDP or RSVP-TE. 2) OSPF or ISIS has been pre-configured. 3) BGP sessions have been established between PEs.

Defining the VRF, the route target and route distinguisher:

In mplsL3VpnVrfTable:

```
{  
    mplsL3VpnVrfName          = "RED",
```

```

mplsL3VpnVrfDescription      = "Intranet of Company ABC",
mplsL3VpnVrfRD               = "100:1", -- octet string
mplsL3VpnVrfRowStatus        = createAndGo(4)
}

```

```

In mplsL3VpnVrfRouteTable:
{
    mplsL3VpnVrfRTRowStatus."Red"."100:1".import = createAndGo,
    mplsL3VpnVrfRTRowStatus."Red"."100:1".export = createAndGo
}

```

## 8. MPLS-L3VPN-STD-MIB Module Definition

MPLS-L3VPN-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
    Integer32, Counter32, Unsigned32, Gauge32
        FROM SNMPv2-SMI -- [RFC2578]
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
        FROM SNMPv2-CONF -- [RFC2580]
    TEXTUAL-CONVENTION, TruthValue, RowStatus,
    TimeStamp, StorageType
        FROM SNMPv2-TC -- [RFC2579]
    InterfaceIndex, InterfaceIndexOrZero
        FROM IF-MIB -- [RFC2863]
    VPNIdOrZero
        FROM VPN-TC-STD-MIB
    SnmpAdminString
        FROM SNMP-FRAMEWORK-MIB -- [RFC3411]
    IANAipRouteProtocol
        FROM IANA-RTPROTO-MIB -- [RTPROTO]
    InetAddress, InetAddressType,
    InetAddressPrefixLength,
    InetAutonomousSystemNumber
        FROM INET-ADDRESS-MIB -- [RFC4001]
    mplsStdMIB
        FROM MPLS-TC-STD-MIB -- [RFC3811]
    MplsIndexType
        FROM MPLS-LSR-STD-MIB -- [RFC3813]

```

mplsL3VpnMIB MODULE-IDENTITY

LAST-UPDATED "200504011200Z" -- 01 April 2005 12:00:00 GMT

ORGANIZATION "IETF Layer-3 Virtual Private  
Networks Working Group."

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Comments and discussion to l3vpn@ietf.org"

DESCRIPTION

"This MIB contains managed object definitions for the  
Layer-3 Multiprotocol Label Switching Virtual  
Private Networks.

Copyright (C) The Internet Society (2005). This  
version of this MIB module is part of RFCXXX; see  
the RFC itself for full legal notices."

-- Revision history.

REVISION

"200504011200Z" -- 01 April 2005 12:00:00 GMT

DESCRIPTION

"Initial version. Published as RFC xxxx." -- RFC-editor pls fill in xxx  
::= { mplsStdMIB 9999 } -- assigned by IANA, see [section 18.1](#) for details

-- Textual Conventions.

MplsL3VpnName ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"An identifier that is assigned to each MPLS/BGP VPN and  
is used to uniquely identify it. This is assigned by the  
system operator or NMS and SHOULD be unique throughout  
the MPLS domain. If this is the case, then this identifier  
can then be used at any LSR within a specific MPLS domain  
to identify this MPLS/BGP VPN. It may also be possible to  
preserve the uniqueness of this identifier across MPLS  
domain boundaries, in which case this identifier can then  
be used to uniquely identify MPLS/BGP VPNs on a more global  
basis. This object MAY be set to the VPN ID as defined in  
[RFC 2685](#)."

REFERENCE

"[RFC 2685](#) Fox B., et al, 'Virtual Private  
Networks Identifier', September 1999."

SYNTAX OCTET STRING (SIZE (0..31))

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MplsL3VpnRouteDistinguisher ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"Syntax for a route distinguisher and route target  
as defined in [[RFC2547bis](#)]."

REFERENCE

"[[RFC2547bis](#)]"

SYNTAX OCTET STRING(SIZE (0..256))

MplsL3VpnRtType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"Used to define the type of a route target usage.  
Route targets can be specified to be imported,  
exported or both. For a complete definition of a  
route target see [[RFC2547bis](#)]."

REFERENCE

"[[RFC2547bis](#)]"

SYNTAX INTEGER { import(1), export(2), both(3) }

-- Top level components of this MIB.

mplsL3VpnNotifications OBJECT IDENTIFIER ::= { mplsL3VpnMIB 0 }

mplsL3VpnObjects OBJECT IDENTIFIER ::= { mplsL3VpnMIB 1 }

mplsL3VpnScalars OBJECT IDENTIFIER ::= { mplsL3VpnObjects 1 }

mplsL3VpnConf OBJECT IDENTIFIER ::= { mplsL3VpnObjects 2 }

mplsL3VpnPerf OBJECT IDENTIFIER ::= { mplsL3VpnObjects 3 }

mplsL3VpnRoute OBJECT IDENTIFIER ::= { mplsL3VpnObjects 4 }

mplsL3VpnConformance OBJECT IDENTIFIER ::= { mplsL3VpnMIB 2 }

--

-- Scalar Objects

--

mplsL3VpnConfiguredVrfs OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of VRFs which are configured on this node."

::= { mplsL3VpnScalars 1 }

mplsL3VpnActiveVrfs OBJECT-TYPE



SYNTAX            Gauge32  
MAX-ACCESS       read-only  
STATUS            current  
DESCRIPTION

"The number of VRFs which are active on this node.  
That is, those VRFs whose corresponding mplsL3VpnVrfOperStatus  
object value is equal to operational (1)."

::= { mplsL3VpnScalars 2 }

mplsL3VpnConnectedInterfaces OBJECT-TYPE

SYNTAX            Gauge32  
MAX-ACCESS       read-only  
STATUS            current  
DESCRIPTION

"Total number of interfaces connected to a VRF."

::= { mplsL3VpnScalars 3 }

mplsL3VpnNotificationEnable OBJECT-TYPE

SYNTAX            TruthValue  
MAX-ACCESS       read-write  
STATUS            current  
DESCRIPTION

"If this object is true, then it enables the  
generation of all notifications defined in  
this MIB. This object's value should be  
preserved across agent re-boots."

REFERENCE

"See also [[RFC3413](#)] for explanation that  
notifications are under the ultimate control of the  
MIB modules in this document."

DEFVAL { false }

::= { mplsL3VpnScalars 4 }

mplsL3VpnVrfConfMaxPossRts OBJECT-TYPE

SYNTAX            Unsigned32  
MAX-ACCESS       read-only  
STATUS            current  
DESCRIPTION

"Denotes maximum number of routes which the device  
will allow all VRFs jointly to hold. If this value is

set to 0, this indicates that the device is unable to determine the absolute maximum. In this case, the configured maximum MAY not actually be allowed by the device."

::= { mplsL3VpnScalars 5 }

mplsL3VpnVrfConfRteMxThrshTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Denotes the interval in seconds, at which the route max threshold notification may be re-issued after the maximum value has been exceeded (or has been reached if mplsL3VpnVrfConfMaxRoutes and mplsL3VpnVrfConfHighRteThresh are equal) and the initial

notification has been issued. This value is intended to prevent continuous generation of notifications by an agent in the event that routes are continually added to a VRF after it has reached its maximum value. If this value is set to 0, the agent should only issue a single notification at the time that the maximum threshold has been reached, and should not issue any more notifications until the value of routes has fallen below the configured threshold value. This is the recommended default behavior."

DEFVAL { 0 }

::= { mplsL3VpnScalars 6 }

mplsL3VpnIllLblRcvThrsh OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The number of illegally received labels above which the mplsNumVrfSecIllglLblThrshExcd notification is issued. The persistence of this value mimics that of the device's configuration."

::= { mplsL3VpnScalars 7 }

```

mplsL3VpnIfConfTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF MplsL3VpnIfConfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "This table specifies per-interface MPLS capability
        and associated information."
    ::= { mplsL3VpnConf 1 }

```

```

mplsL3VpnIfConfEntry OBJECT-TYPE
    SYNTAX          MplsL3VpnIfConfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry in this table is created by an LSR for
        every interface capable of supporting MPLS L3VPN.
        Each entry in this table is meant to correspond to
        an entry in the Interfaces Table."
    INDEX          { mplsL3VpnVrfName, mplsL3VpnIfConfIndex }
    ::= { mplsL3VpnIfConfTable 1 }

```

```

MplsL3VpnIfConfEntry ::= SEQUENCE {
    mplsL3VpnIfConfIndex      InterfaceIndex,
    mplsL3VpnIfVpnClassification  INTEGER,

```

```

    mplsL3VpnIfVpnRouteDistProtocol  BITS,
    mplsL3VpnIfConfStorageType        StorageType,
    mplsL3VpnIfConfRowStatus          RowStatus
}

```

```

mplsL3VpnIfConfIndex OBJECT-TYPE
    SYNTAX          InterfaceIndex
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "This is a unique index for an entry in the
        mplsL3VpnIfConfTable. A non-zero index for an
        entry indicates the ifIndex for the corresponding
        interface entry in the MPLS-VPN-layer in the ifTable.
        Note that this table does not necessarily correspond

```

one-to-one with all entries in the Interface MIB having an ifType of MPLS-layer; rather, only those which are enabled for MPLS L3VPN functionality."

REFERENCE

["RFC2863"](#)

::= { mplsL3VpnIfConfEntry 1 }

mplsL3VpnIfVpnClassification OBJECT-TYPE

SYNTAX INTEGER { carrierOfCarrier (1),  
enterprise (2),  
interProvider (3)  
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Denotes whether this link participates in a carrier-of-carrier's, enterprise, or inter-provider scenario."

DEFVAL { enterprise }

::= { mplsL3VpnIfConfEntry 2 }

mplsL3VpnIfVpnRouteDistProtocol OBJECT-TYPE

SYNTAX BITS { none (0),  
bgp (1),  
ospf (2),  
rip(3),  
isis(4),  
static(5),  
other (6)  
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Denotes the route distribution protocol across the

PE-CE link. Note that more than one routing protocol may be enabled at the same time, thus this object is specified as a bitmask. For example, static(5) and ospf(2) are a typical configuration."

::= { mplsL3VpnIfConfEntry 3 }

```

mplsL3VpnIfConfStorageType  OBJECT-TYPE
    SYNTAX      StorageType
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION "The storage type for this VPN If entry.
                 Conceptual rows having the value 'permanent'
                 need not allow write-access to any columnar
                 objects in the row."

    REFERENCE
        "See RFC2579."
    DEFVAL { volatile }
    ::= { mplsL3VpnIfConfEntry 4 }

mplsL3VpnIfConfRowStatus  OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "This variable is used to create, modify, and/or
         delete a row in this table.  Rows in this
         table signify that the specified interface is
         associated with this VRF.  If the row creation
         operation succeeds, the interface will have been
         associated with the specified VRF, otherwise the
         agent MUST not allow the association.  If the agent
         only allows read-only operations on this table, it
         MUST create entries in this table as they are created
         on the device.  When a row in this
         table is in active(1) state, no objects in that row
         can be modified except mplsL3VpnIfConfStorageType and
         mplsL3VpnIfConfRowStatus."
    ::= { mplsL3VpnIfConfEntry 5 }

-- VRF Configuration Table
mplsL3VpnVrfTable  OBJECT-TYPE
    SYNTAX      SEQUENCE OF MplsL3VpnVrfEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table specifies per-interface MPLS L3VPN
         VRF Table capability and associated information.
         Entries in this table define VRF routing instances
         associated with MPLS/VPN interfaces.  Note that

```

multiple interfaces can belong to the same VRF instance. The collection of all VRF instances comprises an actual VPN."  
 ::= { mplsL3VpnConf 2 }

#### mplsL3VpnVrfEntry OBJECT-TYPE

SYNTAX MplsL3VpnVrfEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION

"An entry in this table is created by an LSR for every VRF capable of supporting MPLS L3VPN. The indexing provides an ordering of VRFs per-VPN interface."

INDEX { mplsL3VpnVrfName }  
 ::= { mplsL3VpnVrfTable 1 }

#### MplsL3VpnVrfEntry ::= SEQUENCE {

mplsL3VpnVrfName	MplsL3VpnName,
mplsL3VpnVrfVpnId	VPNIIdOrZero,
mplsL3VpnVrfDescription	SnmpAdminString,
mplsL3VpnVrfRD	MplsL3VpnRouteDistinguisher,
mplsL3VpnVrfCreationTime	TimeStamp,
mplsL3VpnVrfOperStatus	INTEGER,
mplsL3VpnVrfActiveInterfaces	Gauge32,
mplsL3VpnVrfAssociatedInterfaces	Unsigned32,
mplsL3VpnVrfConfMidRteThresh	Unsigned32,
mplsL3VpnVrfConfHighRteThresh	Unsigned32,
mplsL3VpnVrfConfMaxRoutes	Unsigned32,
mplsL3VpnVrfConfLastChanged	TimeStamp,
mplsL3VpnVrfConfRowStatus	RowStatus,
mplsL3VpnVrfConfAdminStatus	INTEGER,
mplsL3VpnVrfConfStorageType	StorageType

}

#### mplsL3VpnVrfName OBJECT-TYPE

SYNTAX MplsL3VpnName  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION

"The human-readable name of this VPN. This MAY be equivalent to the [RFC2685](#) VPN-ID, but may also vary. If it is set to the VPN ID, it MUST be equivalent to the value of mplsL3VpnVrfVpnId. It is strongly recommended that all sites supporting VRFs that are part of the same VPN use the same naming convention for VRFs as well as the same VPN ID."

REFERENCE

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::= { mplsL3VpnVrfEntry 1 }

mplsL3VpnVrfVpnId OBJECT-TYPE

SYNTAX VPNIIdOrZero

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The VPN ID as specified in [[RFC2685](#)]. If a VPN ID has not been specified for this VRF, then this variable SHOULD be set to an zero-length OCTET STRING."

::= { mplsL3VpnVrfEntry 2 }

mplsL3VpnVrfDescription OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The human-readable description of this VRF."

DEFVAL { "" }

::= { mplsL3VpnVrfEntry 3 }

mplsL3VpnVrfRD OBJECT-TYPE

SYNTAX MplsL3VpnRouteDistinguisher

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The route distinguisher for this VRF."

DEFVAL { "" }

::= { mplsL3VpnVrfEntry 4 }

mplsL3VpnVrfCreationTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time at which this VRF entry was created."

::= { mplsL3VpnVrfEntry 5 }





"Total number of interfaces connected to this VRF  
(independent of ifOperStatus type)."  
::= { mplsL3VpnVrfEntry 8 }

mplsL3VpnVrfConfMidRteThresh OBJECT-TYPE  
SYNTAX Unsigned32  
MAX-ACCESS read-create  
STATUS current  
DESCRIPTION  
"Denotes mid-level water marker for the number  
of routes which this VRF may hold."  
DEFVAL { 0 }  
::= { mplsL3VpnVrfEntry 9 }

mplsL3VpnVrfConfHighRteThresh OBJECT-TYPE  
SYNTAX Unsigned32  
MAX-ACCESS read-create  
STATUS current  
DESCRIPTION

"Denotes high-level water marker for the number of  
routes which this VRF may hold."  
DEFVAL { 0 }  
::= { mplsL3VpnVrfEntry 10 }

mplsL3VpnVrfConfMaxRoutes OBJECT-TYPE  
SYNTAX Unsigned32  
MAX-ACCESS read-create  
STATUS current  
DESCRIPTION  
"Denotes maximum number of routes which this VRF is  
configured to hold. This value MUST be less than or  
equal to mplsL3VpnVrfConfMaxPossRts unless it is set  
to 0."  
DEFVAL { 0 }  
::= { mplsL3VpnVrfEntry 11 }

mplsL3VpnVrfConfLastChanged OBJECT-TYPE  
SYNTAX TimeStamp  
MAX-ACCESS read-only  
STATUS current

DESCRIPTION

"The value of sysUpTime at the time of the last change of this table entry, which includes changes of VRF parameters defined in this table or addition or deletion of interfaces associated with this VRF."

::= { mplsL3VpnVrfEntry 12 }

mplsL3VpnVrfConfRowStatus OBJECT-TYPE

SYNTAX RowStatus  
MAX-ACCESS read-create  
STATUS current

DESCRIPTION

"This variable is used to create, modify, and/or delete a row in this table.

When a row in this table is in active(1) state, no objects in that row can be modified except mplsL3VpnVrfConfAdminStatus, mplsL3VpnVrfConfRowStatus and mplsL3VpnVrfConfStorageType."

::= { mplsL3VpnVrfEntry 13 }

mplsL3VpnVrfConfAdminStatus OBJECT-TYPE

SYNTAX INTEGER {  
                  up(1),      -- ready to pass packets  
                  down(2),    -- can't pass packets  
                  testing(3)  -- in some test mode  
                  }  
MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Indicates the desired operational status of this VRF."

::= { mplsL3VpnVrfEntry 14 }

mplsL3VpnVrfConfStorageType OBJECT-TYPE

SYNTAX StorageType  
MAX-ACCESS read-create  
STATUS current

DESCRIPTION

"The storage type for this VPN VRF entry.

Conceptual rows having the value 'permanent'  
need not allow write-access to any columnar  
objects in the row."

REFERENCE

"See [RFC2579](#)."

DEFVAL { volatile }

::= { mplsL3VpnVrfEntry 15 }

-- MplsL3VpnVrfRTTable

mplsL3VpnVrfRTTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsL3VpnVrfRTEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table specifies per-VRF route target association.  
Each entry identifies a connectivity policy supported  
as part of a VPN."

::= { mplsL3VpnConf 3 }

mplsL3VpnVrfRTEntry OBJECT-TYPE

SYNTAX MplsL3VpnVrfRTEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in this table is created by an LSR for  
each route target configured for a VRF supporting  
a MPLS L3VPN instance. The indexing provides an  
ordering per-VRF instance. See [[RFC2547bis](#)] for a  
complete definition of a route target."

INDEX { mplsL3VpnVrfName, mplsL3VpnVrfRTIndex,  
mplsL3VpnVrfRTType }

::= { mplsL3VpnVrfRTTable 1 }

MplsL3VpnVrfRTEntry ::= SEQUENCE {

mplsL3VpnVrfRTIndex Unsigned32,

mplsL3VpnVrfRTType MplsL3VpnRtType,

mplsL3VpnVrfRT

MplsL3VpnRouteDistinguisher,

mplsL3VpnVrfRTDescr

SnmpAdminString,

mplsL3VpnVrfRTRowStatus

RowStatus,

```
    mplsL3VpnVrfRTStorageType StorageType
}
```

```
mplsL3VpnVrfRTIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "Auxiliary index for route-targets configured for a
        particular VRF."
    ::= { mplsL3VpnVrfRTEntry 2 }
```

```
mplsL3VpnVrfRTType OBJECT-TYPE
    SYNTAX      MplsL3VpnRtType
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The route target distribution type."
    ::= { mplsL3VpnVrfRTEntry 3 }
```

```
mplsL3VpnVrfRT OBJECT-TYPE
    SYNTAX      MplsL3VpnRouteDistinguisher
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "The route target distribution policy."
    DEFVAL { "" }
    ::= { mplsL3VpnVrfRTEntry 4 }
```

```
mplsL3VpnVrfRTDescr OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "Description of the route target."
    DEFVAL { "" }
    ::= { mplsL3VpnVrfRTEntry 5 }
```

```
mplsL3VpnVrfRTRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "This variable is used to create, modify, and/or
        delete a row in this table.  When a row in this
        table is in active(1) state, no objects in that row
```

can be modified except mplsL3VpnVrfRTRowStatus."  
 ::= { mplsL3VpnVrfRTEntry 6 }

mplsL3VpnVrfRTStorageType OBJECT-TYPE

SYNTAX StorageType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The storage type for this VPN RT entry.  
Conceptual rows having the value 'permanent'  
need not allow write-access to any columnar  
objects in the row."

REFERENCE

"See [RFC2579](#)."

DEFVAL { volatile }

::= { mplsL3VpnVrfRTEntry 7 }

-- VRF Security Table

mplsL3VpnVrfSecTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsL3VpnVrfSecEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table specifies per MPLS L3VPN VRF Table  
security-related counters."

::= { mplsL3VpnConf 6 }

mplsL3VpnVrfSecEntry OBJECT-TYPE

SYNTAX MplsL3VpnVrfSecEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in this table is created by an LSR for  
every VRF capable of supporting MPLS L3VPN. Each  
entry in this table is used to indicate security-related  
information for each VRF entry."

AUGMENTS { mplsL3VpnVrfEntry }

::= { mplsL3VpnVrfSecTable 1 }

MplsL3VpnVrfSecEntry ::= SEQUENCE {  
 mplsL3VpnVrfSecIllegalLblVltns Counter32,  
 mplsL3VpnVrfSecDiscontinuityTime TimeStamp  
}

mplsL3VpnVrfSecIllegalLblVltns OBJECT-TYPE

SYNTAX	Counter32
MAX-ACCESS	read-only
STATUS	current

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## DESCRIPTION

"Indicates the number of illegally received labels on this VPN/VRF.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsL3VpnVrfSecDiscontinuityTime."

::= { mplsL3VpnVrfSecEntry 1 }

mplsL3VpnVrfSecDiscontinuityTime OBJECT-TYPE

SYNTAX	TimeStamp
MAX-ACCESS	read-only
STATUS	current

## DESCRIPTION

"The value of sysUpTime on the most recent occasion at which any one or more of this entry's counters suffered a discontinuity. If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."

::= { mplsL3VpnVrfSecEntry 2 }

-- VRF Performance Table

mplsL3VpnVrfPerfTable OBJECT-TYPE

SYNTAX	SEQUENCE OF MplsL3VpnVrfPerfEntry
MAX-ACCESS	not-accessible
STATUS	current

## DESCRIPTION

"This table specifies per MPLS L3VPN VRF Table performance information."

::= { mplsL3VpnPerf 1 }

mplsL3VpnVrfPerfEntry OBJECT-TYPE

SYNTAX	MplsL3VpnVrfPerfEntry
--------	-----------------------

```

MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
    "An entry in this table is created by an LSR for
    every VRF capable of supporting MPLS L3VPN."
AUGMENTS        { mplsL3VpnVrfEntry }
 ::= { mplsL3VpnVrfPerfTable 1 }

```

```

MplsL3VpnVrfPerfEntry ::= SEQUENCE {
    mplsL3VpnVrfPerfRoutesAdded      Counter32,
    mplsL3VpnVrfPerfRoutesDeleted    Counter32,
    mplsL3VpnVrfPerfCurrNumRoutes    Gauge32,

```

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```

    mplsL3VpnVrfPerfRoutesDropped      Counter32,
    mplsL3VpnVrfPerfDiscTime           TimeStamp
}

```

mplsL3VpnVrfPerfRoutesAdded OBJECT-TYPE

```

SYNTAX          Counter32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Indicates the number of routes added to this VPN/VRF
    since the last discontinuity. Discontinuities in
    the value of this counter can occur
    at re-initialization of the management system, and at
    other times as indicated by the value of
    mplsL3VpnVrfPerfDiscTime."
 ::= { mplsL3VpnVrfPerfEntry 1 }

```

mplsL3VpnVrfPerfRoutesDeleted OBJECT-TYPE

```

SYNTAX          Counter32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Indicates the number of routes removed from this VPN/VRF.

    Discontinuities in the value of this counter can occur
    at re-initialization of the management system, and at
    other times as indicated by the value of
    mplsL3VpnVrfPerfDiscTime."

```

::= { mplsL3VpnVrfPerfEntry 2 }

mplsL3VpnVrfPerfCurrNumRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Indicates the number of routes currently used by this VRF."

::= { mplsL3VpnVrfPerfEntry 3 }

mplsL3VpnVrfPerfRoutesDropped OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter should be incremented when the number of routes contained by the specified VRF exceeds or attempts to exceed the maximum allowed value as indicated by mplsL3VpnVrfMaxRouteThreshold."

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsL3VpnVrfPerfDiscTime."

::= { mplsL3VpnVrfPerfEntry 4 }

mplsL3VpnVrfPerfDiscTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime on the most recent occasion at which any one or more of this entry's counters suffered a discontinuity. If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."

::= { mplsL3VpnVrfPerfEntry 5 }



## -- VRF Routing Table

### mplsL3VpnVrfRteTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsL3VpnVrfRteEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"This table specifies per-interface MPLS L3VPN VRF Table routing information. Entries in this table define VRF routing entries associated with the specified MPLS/VPN interfaces. Note that this table contains both BGP and IGP routes, as both may appear in the same VRF."

#### REFERENCE

"[[RFC2096](#)]"

::= { mplsL3VpnRoute 1 }

### mplsL3VpnVrfRteEntry OBJECT-TYPE

SYNTAX MplsL3VpnVrfRteEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"An entry in this table is created by an LSR for every route present configured (either dynamically or statically) within the context of a specific VRF capable of supporting MPLS/BGP VPN. The indexing provides an ordering of VRFs per-VPN interface.

Implementors need to be aware that there are quite a few index objects which together can exceed the size allowed

for an OID. So implementors must make sure that OIDs of column instances in this table will have no more than 128 sub-identifiers, otherwise they cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3."

INDEX { mplsL3VpnVrfName,  
mplsL3VpnVrfRteInetCidrDestType,  
mplsL3VpnVrfRteInetCidrDest,  
mplsL3VpnVrfRteInetCidrPfxLen,  
mplsL3VpnVrfRteInetCidrPolicy,

```

mplsL3VpnVrfRteInetCidrNHopType,
mplsL3VpnVrfRteInetCidrNextHop
}
 ::= { mplsL3VpnVrfRteTable 1 }

```

```

MplsL3VpnVrfRteEntry ::= SEQUENCE {
    mplsL3VpnVrfRteInetCidrDestType      InetAddressType,
    mplsL3VpnVrfRteInetCidrDest          InetAddress,
    mplsL3VpnVrfRteInetCidrPfxLen        InetAddressPrefixLength,
    mplsL3VpnVrfRteInetCidrPolicy        OBJECT IDENTIFIER,
    mplsL3VpnVrfRteInetCidrNHopType      InetAddressType,
    mplsL3VpnVrfRteInetCidrNextHop       InetAddress,
    mplsL3VpnVrfRteInetCidrIfIndex       InterfaceIndexOrZero,
    mplsL3VpnVrfRteInetCidrType          INTEGER,
    mplsL3VpnVrfRteInetCidrProto         IANAipRouteProtocol,
    mplsL3VpnVrfRteInetCidrAge           Gauge32,
    mplsL3VpnVrfRteInetCidrNextHopAS     InetAutonomousSystemNumber,
    mplsL3VpnVrfRteInetCidrMetric1       Integer32,
    mplsL3VpnVrfRteInetCidrMetric2       Integer32,
    mplsL3VpnVrfRteInetCidrMetric3       Integer32,
    mplsL3VpnVrfRteInetCidrMetric4       Integer32,
    mplsL3VpnVrfRteInetCidrMetric5       Integer32,
    mplsL3VpnVrfRteXCPointer             MplsIndexType,
    mplsL3VpnVrfRteInetCidrStatus        RowStatus
}

```

mplsL3VpnVrfRteInetCidrDestType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The type of the mplsL3VpnVrfRteInetCidrDest address, as defined in the InetAddress MIB.

Only those address types that may appear in an actual routing table are allowed as values of this object."

REFERENCE "[RFC4001](#)"

::= { mplsL3VpnVrfRteEntry 1 }

mplsL3VpnVrfRteInetCidrDest OBJECT-TYPE

SYNTAX        InetAddress  
MAX-ACCESS not-accessible  
STATUS        current  
DESCRIPTION

"The destination IP address of this route.

The type of this address is determined by the value of the mplsL3VpnVrfRteInetCidrDestType object.

The values for the index objects mplsL3VpnVrfRteInetCidrDest and mplsL3VpnVrfRteInetCidrPfxLen must be consistent. When the value of mplsL3VpnVrfRteInetCidrDest is x, then the bitwise logical-AND of x with the value of the mask formed from the corresponding index object mplsL3VpnVrfRteInetCidrPfxLen MUST be equal to x. If not, then the index pair is not consistent and an inconsistentName error must be returned on SET or CREATE requests."

::= { mplsL3VpnVrfRteEntry 2 }

mplsL3VpnVrfRteInetCidrPfxLen OBJECT-TYPE

SYNTAX        InetAddressPrefixLength (0..128)  
MAX-ACCESS not-accessible  
STATUS        current  
DESCRIPTION

"Indicates the number of leading one bits which form the mask to be logical-ANDed with the destination address before being compared to the value in the mplsL3VpnVrfRteInetCidrDest field.

The values for the index objects mplsL3VpnVrfRteInetCidrDest and mplsL3VpnVrfRteInetCidrPfxLen must be consistent. When the value of mplsL3VpnVrfRteInetCidrDest is x, then the bitwise logical-AND of x with the value of the mask formed from the corresponding index object mplsL3VpnVrfRteInetCidrPfxLen MUST be equal to x. If not, then the index pair is not consistent and an inconsistentName error must be returned on SET or CREATE requests."

::= { mplsL3VpnVrfRteEntry 3 }

mplsL3VpnVrfRteInetCidrPolicy OBJECT-TYPE

SYNTAX        OBJECT IDENTIFIER  
MAX-ACCESS not-accessible  
STATUS        current  
DESCRIPTION

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"This object is an opaque object without any defined semantics. Its purpose is to serve as an additional index which may delineate between multiple entries to the same destination. The value { 0 0 } shall be used as the default value for this object."

::= { mplsL3VpnVrfRteEntry 4 }

mplsL3VpnVrfRteInetCidrNHopType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The type of the mplsL3VpnVrfRteInetCidrNextHop address, as defined in the InetAddress MIB.

Value should be set to unknown(0) for non-remote routes.

Only those address types that may appear in an actual routing table are allowed as values of this object."

REFERENCE "[RFC4001](#)"

::= { mplsL3VpnVrfRteEntry 5 }

mplsL3VpnVrfRteInetCidrNextHop OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"On remote routes, the address of the next system en route. For non-remote routes, a zero length string.

The type of this address is determined by the value of the mplsL3VpnVrfRteInetCidrNHopType object."

::= { mplsL3VpnVrfRteEntry 6 }

mplsL3VpnVrfRteInetCidrIfIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The ifIndex value which identifies the local interface through which the next hop of this route should be reached. A value of 0 is valid and represents the

```

        scenario where no interface is specified."
DEFVAL { 0 }
::= { mplsL3VpnVrfRteEntry 7 }

mplsL3VpnVrfRteInetCidrType OBJECT-TYPE
    SYNTAX      INTEGER {
        other    (1), -- not specified by this MIB

```

```

        reject    (2), -- route which discards traffic and
                        -- returns ICMP notification
        local     (3), -- local interface

        remote    (4), -- remote destination
        blackhole(5) -- route which discards traffic
                        -- silently
    }
MAX-ACCESS read-create
STATUS      current
DESCRIPTION
    "The type of route. Note that local(3) refers to a
    route for which the next hop is the final destination;
    remote(4) refers to a route for which the next hop is
    not the final destination.

    Routes which do not result in traffic forwarding or
    rejection should not be displayed even if the
    implementation keeps them stored internally.

    reject(2) refers to a route which, if matched, discards
    the message as unreachable and returns a notification
    (e.g. ICMP error) to the message sender. This is used
    in some protocols as a means of correctly aggregating
    routes.

    blackhole(5) refers to a route which, if matched,
    discards the message silently."
DEFVAL { other }
::= { mplsL3VpnVrfRteEntry 8 }

mplsL3VpnVrfRteInetCidrProto OBJECT-TYPE
    SYNTAX      IANAipRouteProtocol

```

```

MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The routing mechanism via which this route was learned.
    Inclusion of values for gateway routing protocols is
    not intended to imply that hosts should support those
    protocols."
 ::= { mplsL3VpnVrfRteEntry 9 }

mplsL3VpnVrfRteInetCidrAge OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of seconds since this route was last updated
        or otherwise determined to be correct.  Note that no

```

```

    semantics of 'too old' can be implied except through
    knowledge of the routing protocol by which the route
    was learned."
 ::= { mplsL3VpnVrfRteEntry 10 }

mplsL3VpnVrfRteInetCidrNextHopAS OBJECT-TYPE
    SYNTAX      InetAutonomousSystemNumber
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The Autonomous System Number of the Next Hop. The
        semantics of this object are determined by the
        routing protocol specified in the route's
        mplsL3VpnVrfRteInetCidrProto value. When this
        object is unknown or not relevant its value should
        be set to zero."
    DEFVAL { 0 }
    ::= { mplsL3VpnVrfRteEntry 11 }

mplsL3VpnVrfRteInetCidrMetric1 OBJECT-TYPE
    SYNTAX      Integer32 (-1 | 0..2147483647)
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION

```

```

        "The primary routing metric for this route.  The
        semantics of this metric are determined by the
        routing protocol specified in the route's
        mplsL3VpnVrfRteInetCidrProto value.  If this
        metric is not used, its value should be set to
        -1."
    DEFVAL { -1 }
    ::= { mplsL3VpnVrfRteEntry 12 }

mplsL3VpnVrfRteInetCidrMetric2 OBJECT-TYPE
    SYNTAX      Integer32 (-1 | 0..2147483647)
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "An alternate routing metric for this route.  The
        semantics of this metric are determined by the routing
        protocol specified in the route's
        mplsL3VpnVrfRteInetCidrProto
        value.  If this metric is not used, its value should be
        set to -1."
    DEFVAL { -1 }
    ::= { mplsL3VpnVrfRteEntry 13 }

mplsL3VpnVrfRteInetCidrMetric3 OBJECT-TYPE
    SYNTAX      Integer32 (-1 | 0..2147483647)

```

```

    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "An alternate routing metric for this route.  The
        semantics of this metric are determined by the routing
        protocol specified in the route's
        mplsL3VpnVrfRteInetCidrProto
        value.  If this metric is not used, its value should be
        set to -1."
    DEFVAL { -1 }
    ::= { mplsL3VpnVrfRteEntry 14 }

mplsL3VpnVrfRteInetCidrMetric4 OBJECT-TYPE
    SYNTAX      Integer32 (-1 | 0..2147483647)
    MAX-ACCESS  read-create

```

STATUS current

DESCRIPTION

"An alternate routing metric for this route. The semantics of this metric are determined by the routing protocol specified in the route's mplsL3VpnVrfRteInetCidrProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }

::= { mplsL3VpnVrfRteEntry 15 }

mplsL3VpnVrfRteInetCidrMetric5 OBJECT-TYPE

SYNTAX Integer32 (-1 | 0..2147483647)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"An alternate routing metric for this route. The semantics of this metric are determined by the routing protocol specified in the route's mplsL3VpnVrfRteInetCidrProto value. If this metric is not used, its value should be set to -1."

DEFVAL { -1 }

::= { mplsL3VpnVrfRteEntry 16 }

mplsL3VpnVrfRteXCPointer OBJECT-TYPE

SYNTAX MplsIndexType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Index into mplsXCTable which identifies which cross connect entry is associated with this VRF route entry by containing the mplsXCIndex of that cross-connect entry. The string containing the single octet 0x00 indicates that a label stack is not associated with this route entry. This can be the case because the label bindings have not yet

been established, or because some change in the agent has removed them.

When the label stack associated with this VRF route is created, it MUST establish the associated cross-connect entry in the mplsXCTable and then set that index to the value



of this object. Changes to the cross-connect object in the mplsXCTable MUST automatically be reflected the value of this object. If this object represents a static routing entry, then the manager must ensure that this entry is also maintained consistently in the corresponding mplsXCTable as well."

#### REFERENCE

"[RFC 3813](#) - Multiprotocol Label Switching (MPLS) Label Switching Router (LSR) Management Information base (MIB), C. Srinivasan, A. Vishwanathan, and T. Nadeau, June 2004"

::= { mplsL3VpnVrfRteEntry 17 }

mplsL3VpnVrfRteInetCidrStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The row status variable, used according to row installation and removal conventions.

A row entry cannot be modified when the status is marked as active(1)."

::= { mplsL3VpnVrfRteEntry 18 }

-- MPLS L3VPN Notifications

mplsL3VpnVrfUp NOTIFICATION-TYPE

OBJECTS { mplsL3VpnIfConfRowStatus,  
mplsL3VpnVrfOperStatus  
}

STATUS current

DESCRIPTION

"This notification is generated when:

- a. The ifOperStatus of an interface associated with a VRF changes to the up(1) state.
- b. When an interface with ifOperStatus = up(1) is associated with a VRF."

::= { mplsL3VpnNotifications 1 }

mplsL3VpnVrfDown NOTIFICATION-TYPE

OBJECTS { mplsL3VpnIfConfRowStatus,  
mplsL3VpnVrfOperStatus  
}

STATUS current

DESCRIPTION

"This notification is generated when:

- a. The ifOperStatus of an interface associated with a VRF changes to the down(1) state.
- b. When an interface with ifOperStatus = up(1) state is disassociated with a VRF."

::= { mplsl3VpnNotifications 2 }

**mplsl3VpnVrfRouteMidThreshExceeded NOTIFICATION-TYPE**

OBJECTS { mplsl3VpnVrfPerfCurrNumRoutes,  
mplsl3VpnVrfConfMidRteThresh  
}

STATUS current

DESCRIPTION

"This notification is generated when the number of routes contained by the specified VRF exceeds the value indicated by mplsl3VpnVrfMidRouteThreshold. A single notification MUST be generated when this threshold is exceeded, and no other notifications of this type should be issued until the value of mplsl3VpnVrfPerfCurrNumRoutes has fallen below that of mplsl3VpnVrfConfMidRteThresh."

::= { mplsl3VpnNotifications 3 }

**mplsl3VpnVrfNumVrfRouteMaxThreshExceeded NOTIFICATION-TYPE**

OBJECTS { mplsl3VpnVrfPerfCurrNumRoutes,  
mplsl3VpnVrfConfHighRteThresh  
}

STATUS current

DESCRIPTION

"This notification is generated when the number of routes contained by the specified VRF exceeds or attempts to exceed the maximum allowed value as indicated by mplsl3VpnVrfMaxRouteThreshold. In cases where mplsl3VpnVrfConfHighRteThresh is set to the same value as mplsl3VpnVrfConfMaxRoutes, mplsl3VpnVrfConfHighRteThresh need not be exceeded; rather, just reached for this notification to be issued.

Note that mplsl3VpnVrfConfRteMxThrshTime denotes the interval at which the this notification will be re-issued after the maximum value has been exceeded (or reached if mplsl3VpnVrfConfMaxRoutes and mplsl3VpnVrfConfHighRteThresh are equal) and the initial notification has been issued. This value is intended to prevent continuous generation of notifications by an agent in the event that routes are continually added to a VRF after it has reached its maximum value. The default value is 0 minutes. If this value is set to 0, the agent should only issue a single notification at the time that the maximum threshold has been reached, and should not issue any more notifications until the value of routes has fallen below the configured threshold

value."

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::= { mplsL3VpnNotifications 4 }

mplsL3VpnNumVrfSecIllglLblThrshExcd NOTIFICATION-TYPE

OBJECTS { mplsL3VpnVrfSecIllegalLblVltns }

STATUS current

DESCRIPTION

"This notification is generated when the number of illegal label violations on a VRF as indicated by mplsL3VpnVrfSecIllegalLblVltns has exceeded mplsL3VpnIllLblRcvThrsh. The threshold is not included in the varbind here because the value of mplsL3VpnVrfSecIllegalLblVltns should be one greater than the threshold at the time this notification is issued."

::= { mplsL3VpnNotifications 5 }

mplsL3VpnNumVrfRouteMaxThreshCleared NOTIFICATION-TYPE

OBJECTS { mplsL3VpnVrfPerfCurrNumRoutes,  
mplsL3VpnVrfConfHighRteThresh  
}

STATUS current

DESCRIPTION

"This notification is generated only after the number of routes contained by the specified VRF exceeds or attempts to exceed the maximum allowed value as indicated by mplsVrfMaxRouteThreshold, and then falls below this value. The emission of this notification informs the operator that the error condition has been cleared without the operator having to query the device.

Note that mplsL3VpnVrfConfRteMxThrshTime denotes the interval at which the the mplsNumVrfRouteMaxThreshExceeded notification will be re-issued after the maximum value has been exceeded (or reached if mplsL3VpnVrfConfMaxRoutes and mplsL3VpnVrfConfHighRteThresh are equal) and the initial notification has been issued. Therefore, the generation of this notification should also be emitted with this same frequency (assuming that the error condition is cleared). Specifically, if the error condition is reached and

cleared several times during the period of time specified in mplsL3VpnVrfConfRteMxThrshTime, only a single notification will be issued to indicate the first instance of the error condition as well as the first time the error condition is cleared. This behavior is intended to prevent continuous generation of notifications by an agent in the event that routes are continually added and removed to/from a VRF after it has reached its maximum value. The default value is 0. If this value is set to 0, the agent should issue a notification whenever the maximum threshold has been cleared."

```
::= { mplsL3VpnNotifications 6 }
```

```
-- Conformance Statement
```

```
mplsL3VpnGroups
```

```
    OBJECT IDENTIFIER ::= { mplsL3VpnConformance 1 }
```

```
mplsL3VpnCompliances
```

```
    OBJECT IDENTIFIER ::= { mplsL3VpnConformance 2 }
```

```
-- Module Compliance
```

```
mplsL3VpnModuleFullCompliance MODULE-COMPLIANCE
```

```
    STATUS current
```

```
    DESCRIPTION
```

```
        "Compliance statement for agents that provide full support  
        for the L3 MPLS VPN MIB"
```

```
    MODULE -- this module
```

```
        MANDATORY-GROUPS { mplsL3VpnScalarGroup,  
                             mplsL3VpnVrfGroup,  
                             mplsL3VpnIfGroup,  
                             mplsL3VpnPerfGroup,  
                             mplsL3VpnVrfRteGroup,  
                             mplsL3VpnVrfRTGroup,  
                             mplsL3VpnSecGroup,  
                             mplsL3VpnNotificationGroup  
                           }
```

```
GROUP          mplsL3VpnPerfRouteGroup
```

```
DESCRIPTION "This group is only mandatory for LSRs that  
            support tracking the number of routes attempted
```

OBJECT	mplsL3VpnIfConfRowStatus
SYNTAX	RowStatus { active(1), notInService(2) }
WRITE-SYNTAX	RowStatus { active(1), notInService(2), createAndGo(4), destroy(6) }
DESCRIPTION	"Support for createAndWait and notReady is not required."

OBJECT	mplsL3VpnVrfConfRowStatus
SYNTAX	RowStatus { active(1), notInService(2) }
WRITE-SYNTAX	RowStatus { active(1), notInService(2), createAndGo(4), destroy(6) }
DESCRIPTION	"Support for createAndWait and notReady is not required."

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OBJECT	mplsL3VpnVrfrTRowStatus
SYNTAX	RowStatus { active(1), notInService(2) }
WRITE-SYNTAX	RowStatus { active(1), notInService(2), createAndGo(4), destroy(6) }
DESCRIPTION	"Support for createAndWait and notReady is not required."

```
--
-- ReadOnly Compliance
--
```

```
DESCRIPTION "Compliance requirement for implementations that only
provide read-only support for L3-MPLS-VPN-STD-MIB.
Such devices can then be monitored but cannot be
```

```

        configured using this MIB module.
    "
MODULE -- this module
    MANDATORY-GROUPS { mplsL3VpnScalarGroup,
                        mplsL3VpnVrfGroup,
                        mplsL3VpnIfGroup,
                        mplsL3VpnPerfGroup,
                        mplsL3VpnVrfRteGroup,
                        mplsL3VpnVrfRTGroup,
                        mplsL3VpnSecGroup,
                        mplsL3VpnNotificationGroup
                      }

GROUP      mplsL3VpnPerfRouteGroup
DESCRIPTION "This group is only mandatory for LSRs that
            support tracking the number of routes attempted to
            be added to VRFs."

OBJECT     mplsL3VpnIfConfRowStatus
SYNTAX     RowStatus { active(1) }
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

OBJECT     mplsL3VpnVrfConfRowStatus
SYNTAX     RowStatus { active(1) }
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

```

```

OBJECT     mplsL3VpnVrfRTRowStatus
SYNTAX     RowStatus { active(1) }
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

OBJECT     mplsL3VpnIfVpnClassification
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

OBJECT     mplsL3VpnIfVpnRouteDistProtocol
MIN-ACCESS read-only
DESCRIPTION "Write access is not required."

```

OBJECT mplsL3VpnIfConfStorageType  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfVpnId  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfDescription  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfRD  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfConfMidRteThresh  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfConfHighRteThresh  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfConfMaxRoutes  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfConfStorageType  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfRT  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT mplsL3VpnVrfRTDescr  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required."

OBJECT	mplsL3VpnVrfRTStorageType
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrIfIndex
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrType
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrNextHopAS
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrMetric1
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrMetric2
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrMetric3
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrMetric4
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrMetric5
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteXCPointer
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	mplsL3VpnVrfRteInetCidrStatus
SYNTAX	RowStatus { active(1) }
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."



```
::= { mplsL3VpnCompliances 2 }
```

```
-- Units of conformance.
```

```
mplsL3VpnScalarGroup OBJECT-GROUP
```

```
  OBJECTS { mplsL3VpnConfiguredVrfs,
             mplsL3VpnActiveVrfs,
             mplsL3VpnConnectedInterfaces,
             mplsL3VpnNotificationEnable,
             mplsL3VpnVrfConfMaxPossRts,
             mplsL3VpnVrfConfRteMxThrshTime,
             mplsL3VpnI111Lb1RcvThrsh
           }
```

```
  STATUS current
```

```
  DESCRIPTION
```

```
    "Collection of scalar objects required for MPLS VPN
    management."
```

```
 ::= { mplsL3VpnGroups 1 }
```

```
mplsL3VpnVrfGroup OBJECT-GROUP
```

```
  OBJECTS { mplsL3VpnVrfVpnId,
             mplsL3VpnVrfDescription,
             mplsL3VpnVrfRD,
             mplsL3VpnVrfCreationTime,
             mplsL3VpnVrfOperStatus,
             mplsL3VpnVrfActiveInterfaces,
             mplsL3VpnVrfAssociatedInterfaces,
             mplsL3VpnVrfConfMidRteThresh,
             mplsL3VpnVrfConfHighRteThresh,
             mplsL3VpnVrfConfMaxRoutes,
             mplsL3VpnVrfConfLastChanged,
             mplsL3VpnVrfConfRowStatus,
             mplsL3VpnVrfConfAdminStatus,
             mplsL3VpnVrfConfStorageType
           }
```

```
  STATUS current
```

```
  DESCRIPTION
```

```
    "Collection of objects needed for MPLS VPN VRF
    management."
```

```
 ::= { mplsL3VpnGroups 2 }
```

```
mplsL3VpnIfGroup OBJECT-GROUP
```

```
  OBJECTS { mplsL3VpnIfVpnClassification,
             mplsL3VpnIfVpnRouteDistProtocol,
             mplsL3VpnIfConfStorageType,
             mplsL3VpnIfConfRowStatus
           }
```

```
    }  
    STATUS current  
    DESCRIPTION
```

```
    "Collection of objects needed for MPLS VPN interface  
    management."  
 ::= { mplsL3VpnGroups 3 }  
  
mplsL3VpnPerfGroup OBJECT-GROUP  
    OBJECTS { mplsL3VpnVrfPerfRoutesAdded,  
              mplsL3VpnVrfPerfRoutesDeleted,  
              mplsL3VpnVrfPerfCurrNumRoutes  
            }  
    STATUS current  
    DESCRIPTION  
        "Collection of objects needed for MPLS VPN  
        performance information."  
 ::= { mplsL3VpnGroups 4 }  
  
mplsL3VpnPerfRouteGroup OBJECT-GROUP  
    OBJECTS { mplsL3VpnVrfPerfRoutesDropped,  
              mplsL3VpnVrfPerfDiscTime  
            }  
    STATUS current  
    DESCRIPTION  
        "Collection of objects needed to track MPLS VPN  
        routing table dropped routes."  
 ::= { mplsL3VpnGroups 5 }  
  
mplsL3VpnSecGroup OBJECT-GROUP  
    OBJECTS { mplsL3VpnVrfSecIllegalLblVltns,  
              mplsL3VpnVrfSecDiscontinuityTime }  
    STATUS current  
    DESCRIPTION  
        "Collection of objects needed for MPLS VPN  
        security-related information."  
 ::= { mplsL3VpnGroups 7 }  
  
mplsL3VpnVrfRteGroup OBJECT-GROUP  
    OBJECTS {  
        mplsL3VpnVrfRteInetCidrIfIndex,
```

```

mplsL3VpnVrfRteInetCidrType,
mplsL3VpnVrfRteInetCidrProto,
mplsL3VpnVrfRteInetCidrAge,
mplsL3VpnVrfRteInetCidrNextHopAS,
mplsL3VpnVrfRteInetCidrMetric1,
mplsL3VpnVrfRteInetCidrMetric2,
mplsL3VpnVrfRteInetCidrMetric3,
mplsL3VpnVrfRteInetCidrMetric4,
mplsL3VpnVrfRteInetCidrMetric5,
mplsL3VpnVrfRteXCPointer,
mplsL3VpnVrfRteInetCidrStatus
}

```

```

STATUS current
DESCRIPTION
    "Objects required for VRF route table management."
 ::= { mplsL3VpnGroups 8 }

mplsL3VpnVrfRTGroup OBJECT-GROUP
    OBJECTS { mplsL3VpnVrfRTDescr,
               mplsL3VpnVrfRT,
               mplsL3VpnVrfRTRowStatus,
               mplsL3VpnVrfRTStorageType
            }
    STATUS current
    DESCRIPTION
        "Objects required for VRF route target management."
 ::= { mplsL3VpnGroups 9 }

mplsL3VpnNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS { mplsL3VpnVrfUp,
                    mplsL3VpnVrfDown,
                    mplsL3VpnVrfRouteMidThreshExceeded,
                    mplsL3VpnVrfNumVrfRouteMaxThreshExceeded,
                    mplsL3VpnNumVrfSecIllglLblThrshExcd,
                    mplsL3VpnNumVrfRouteMaxThreshCleared
                  }
    STATUS current
    DESCRIPTION
        "Objects required for MPLS VPN notifications."
 ::= { mplsL3VpnGroups 10 }

```

END

-- End of MPLS-VPN-MIB

## 9. Acknowledgments

This document has benefited from discussions and input from Bill Fenner, Gerald Ash, Sumit Mukhopadhyay, Mike Piecuch, and Joan Weiss.

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## 14. Dedication

Steve Brannon passed away suddenly on January 30, 2001. We would like to dedicate our efforts in this area and this document to his memory.

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## [16](#). Security Considerations

It is clear that these MIB modules are potentially useful for monitoring of MPLS LSRs supporting L3 MPLS VPN. This MIB module can also be used for configuration of certain objects, and anything that can be configured can be incorrectly configured, with potentially disastrous results.

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

- o the `mplsL3VpnVrfRouteTable`, `mplsL3VpnIfConfTable` and `mplsL3VpnVrfTable` tables collectively contain objects which may be used to provision MPLS VRF interfaces and configuration. Unauthorized access to objects in these tables, could result in disruption of traffic on the network. This is especially true if these VRFs have been previously provisioned and are in use. The use of stronger mechanisms such as SNMPv3 security should be considered where possible. Specifically, SNMPv3 VACM and USM MUST be used with any v3 agent which implements this MIB module. Administrators should consider whether read access to these objects should be allowed,



since read access may be undesirable under certain circumstances.

Some of the readable objects in this MIB module (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 mplsL3VpnVrfTable, mplsL3VpnIfConfTable tables collectively show the VRF interfaces and associated VRF configurations as well as their linkages to other MPLS-related configuration and/or performance statistics. Administrators not wishing to reveal this information should consider these objects sensitive/vulnerable and take precautions so they are not revealed.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, 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.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [\[RFC3410\]](#), [section 8](#)), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

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.

## [18.](#) IANA Considerations

As described in MPLS-TC-STD-MIB [[RFC3811](#)], MPLS related standards track MIB modules should be rooted under the mplsStdMIB subtree. There is one MPLS-related MIB module contained in this document. Each of the following "IANA Considerations" subsections requests IANA for a new assignment under the mplsStdMIB subtree. New assignments can only be made via a Standards Action as specified in [[RFC2434](#)].

#### [18.1](#). IANA Considerations for MPLS-L3VPN-STD-MIB

The IANA is requested to assign { mplsStdMIB 11 } to the MPLS-L3VPN-STD-MIB module specified in this document.