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MultiProtocol Label Switching (MPLS) Setup Policy Information Base
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Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [\[RFC-2119\]](#).

Abstract

This document specifies a set of provisioning classes (PRC) for configuring a MultiProtocol Label Switching (MPLS) router. Instances of these classes reside in a virtual information store called MPLS Setup Policy Information Base (PIB). COPS protocol [\[COPS\]](#) with the extensions for provisioning [\[COPS-PR\]](#) is used to transmit this MPLS Setup policy information to MPLS Routers. The PRCs defined in this MPLS Setup PIB are intended for use by the COPS-PR MPLS client type. They complement the PRCs defined in the Framework PIB [\[FR-PIB\]](#).

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1. Introduction

Multiprotocol Label Switching (MPLS) [[MPLS-ARCH](#)] defines an architecture where data packets are forwarded based on a short label instead of the entire packet header. This allows faster processing of packets as well as network traffic engineering. The sequence of routers or hops taken by a packet with MPLS label is called Label Switched Path (LSP) and a router that forwards the packets based on MPLS label is a Label Switching Router (LSR).

In order to distribute labels and configure LSPs, a label distribution protocol is used. MPLS allows for multiple signaling protocols. Two protocols that seem to be prominent are RSVP-TE (RSVP-TE: Extensions to RSVP for LSP Tunnels) [[RSVP-TE](#)] and CR-LDP (Constraint-Based LSP Setup using LDP).

Configuring and managing the LSPs can be a difficult task especially when there are a large number of LSPs and when multiple routers are to be configured. Policy Based Management (PBM), as specified in [[RAP-FRAMEWORK](#)], is a good solution to configure and manage MPLS routers.

In PBM, using the configuration model, a Policy Decision Point (PDP) downloads policies to Policy Enforcement Points (PEPs) whenever required. Policy provisioning is done by means of the COPS protocol [[COPS](#)] with the extensions for provisioning [[COPS-PR](#)]. The MPLS routers act as PEPs and a PDP can provision the required policies to these devices. The policies consist of information required to configure MPLS LSPs on an MPLS router.

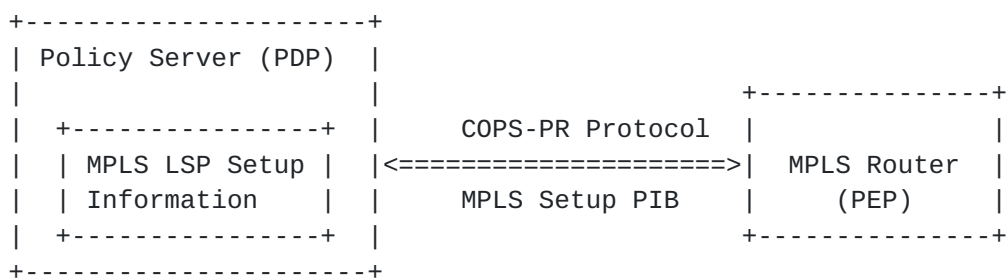


Fig. 1. MPLS LSP Setup using COPS-PR

This document specifies the format of policy information required for MPLS LSP Setup in the form of PIB. The PIB contained in this draft is written using SPPI (Structure of Policy Provisioning Information) [[SPPI](#)]. This PIB specifies PROvisioning Classes (PRCs) for configuring an MPLS router.

The PRCs defined in this MPLS Setup PIB are intended for use by the

COPS-PR MPLS Setup client type. Furthermore, these PRCs are in addition to the PRCs defined in the Framework PIB [[FR-PIB](#)].

2. Operation Overview

A brief description of interaction between PEP (MPLS router) and PDP (policy server) is given in the next paragraph. For a more detailed description of protocol exchange between PDP and provisioning PEPs, please see [[COPS-PR](#)].

Once TCP connection is established between the PEP and the PDP, the PEP sends a Client-Open message to the PDP, specifying MPLS Setup client type. The PDP responds with a Client-Accept (CAT) message. The PDP may send a Client-Close message, if it does not recognize the MPLS Setup client type. After receiving CAT message, the PEP sends a request (REQ) message to the PDP. The REQ message contains a configuration request context object and relevant PIB class instances that include the PEP's (MPLS Router's) capabilities, supported PIB classes etc. The PDP then sends a Decision (DEC) message that includes all the PIB classes that are used to configure the MPLS LSPs on the PEP. The PEP uses the information in the DEC message and configures LSPs accordingly. The PEP then sends a Report-State (RPT) message to the PDP indicating success or failure to install the policies. The PEP may also send periodic RPT messages to inform about status of installed policies or to convey accounting/monitoring type information to the PDP. The PEP may issue updated REQ message if there is any change in its status and the PDP may send updated DEC message with update PIB whenever necessary. The PEP can delete a request by sending Delete-Request (DRQ) message to the PDP. The PDP may also ask the PEP to delete an existing request state by sending a command via DEC message. Finally, Client-Close (CC) message is used to cancel the corresponding Client-Open message.

3. Structure of MPLS Setup PIB

The MPLS PIB consists of six main groups of PRCs. The first group contains PRCs for MPLS Forward Equivalence Class (FEC). The second group contains PRCs for MPLS label request objects. The third group contains PRCs for MPLS Traffic (Flow) specifications. The fourth group contains PRCs for MPLS LSP Explicit Route Objects (ERO). The fifth group contains a PRC for MPLS LSP Preemption parameters. The sixth and final group contains a PRC for MPLS LSPs that essentially tie instances of the first five groups together.

The following simple figure shows the relationship between the various PRC groups.

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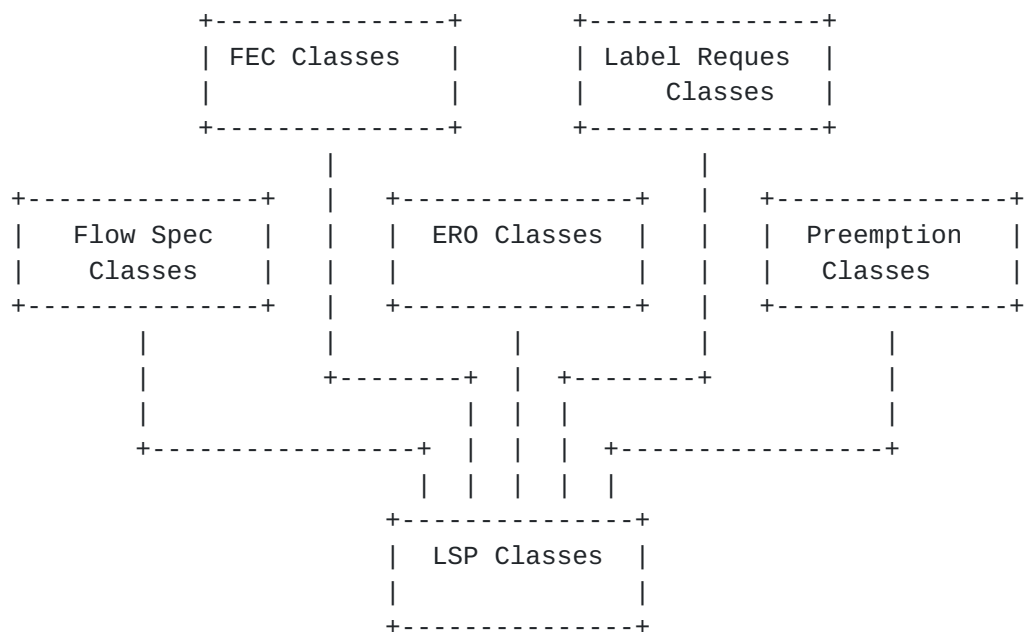


Fig. 2. Relationships of MPLS Setup PRCs (Classes)

3.1. Forward Equivalence Class (FEC) Classes

This group contains PRCs for MPLS FEC. Each PRC defines a type of FEC. The various types of FECs are IPv4 host address, IPv6 host address, IPv4 prefix, IPv6 prefix and Autonomous System number.

3.2. Label Request Classes

This group contains PRCs for MPLS Label Request objects. The three PRCs in this group define Generic Label Request object, ATM Label Request object and Frame Relay Label Request object.

3.3. Flow (Traffic) Specification Classes

This group contains PRCs for Traffic Parameters for LSPs. The three PRCs in this group define MPLS traffic specification, Integrated Services Controlled Load Service flow specification and Integrated Services Guaranteed Service flow specification. The first one is used in CR-LDP and the rest are used in RSVP-TE.

3.4. Explicit Route Object (ERO) Classes

This group contains PRCs for ERO. There are three PRCs that define the three types of Sub Objects; namely, IPv4 Prefix, IPv6 Prefix and Autonomous System Number. The fourth PRC is used to make a list with any of the above three sub objects and the fifth PRC is used to group the subjects together to form an ERO list for an LSP.

3.5. Preemption Classes

This group contains a PRC for defining LSP Preemption parameters.

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3.6. LSP Setup Classes

This group contains a PRC for tying instances of above PRCs to form an LSP. This PRC contains pointers to instances of other PRCs to collect all the parameters required for setting up an LSP.

4. The MPLS Setup PIB

```
MPLS-SETUP-PIB PIB-DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE,
    TEXTUAL-CONVENTION, MODULE-COMPLIANCE,
    OBJECT-IDENTITY, OBJECT-GROUP
    FROM COPS-PR-SPPI
    TruthValue
    FROM SNMPv2-TC
    InstanceId, ReferenceId, TagId, TagReference
    FROM COPS-PR-SPPI-TC
    SnmpAdminString
    FROM SNMP-FRAMEWORK-MIB
    InetAddressIPv4, InetAddressIPv6
    FROM INET-ADDRESS-MIB
```

```
mplsSetupPib MODULE-IDENTITY
```

```
    SUBJECT-CATEGORIES SUBJECT-CATEGORY { tbd û MPLS Setup Client
Type }
```

```
    LAST-UPDATED "200107131000Z"
```

```
    ORGANIZATION " WG"
```

```
    CONTACT-INFO "
```

```
        Harsha Hegde
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        Fax: +1 503 264 3483
```

Email: ravi.sahita@intel.com

"

DESCRIPTION

"This PIB module contains a set of provisioning classes

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```
        that are used to setup MPLS LSPs on MPLS Routers."
 ::= { tbd }
```

```
--
```

```
-- Forward Equivalence Class (FEC) Classes
```

```
--
```

```
mplsFecClasses OBJECT IDENTIFIER ::= { mplsSetupPib 1 }
```

```
--
```

```
-- IPv4 Host Address FEC Table
```

```
--
```

```
mplsFecIPv4HostAddrTable OBJECT-TYPE
```

```
    SYNTAX          SEQUENCE OF MplsFecIPv4HostAddrEntry
```

```
    PIB-ACCESS      install
```

```
    STATUS          current
```

```
    DESCRIPTION
```

```
        "This table consists of MPLS IPv4 FEC Entrees."
```

```
 ::= { mplsFecClasses 1 }
```

```
mplsFecIPv4HostAddrEntry OBJECT-TYPE
```

```
    SYNTAX          MplsFecIPv4HostAddrEntry
```

```
    STATUS          current
```

```
    DESCRIPTION
```

```
        "An instance of this class describes MPLS IPv4 Host Address  
        FEC. "
```

```
    PIB-INDEX { mplsFecIPv4HostAddrPrid }
```

```
 ::= { mplsFecIPv4HostAddrTable 1 }
```

```
MplsFecIPv4HostAddrEntry ::= SEQUENCE {
```

```
    mplsFecIPv4HostAddrPrid      InstanceId,
```

```
    mplsFecIPv4HostAddrIpAddr    InetAddressIPv4 }
```

```
mplsFecIPv4HostAddrPrid OBJECT-TYPE
```

```
    SYNTAX          InstanceId
```

```
    STATUS          current
```

```
    DESCRIPTION
```

```
        "An integer index that uniquely identifies an instance of  
        the mplsFecIPv4HostAddrEntry class."
```

```
 ::= { mplsFecIPv4HostAddrEntry 1 }
```

```
mplsFecIPv4HostAddrIpAddr OBJECT-TYPE
```

```
    SYNTAX          InetAddressIPv4
```

STATUS	current
DESCRIPTION	"IPv4 Host Address in a FEC."

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```
 ::= { mplsFecIPv4HostAddrEntry 2 }

--
-- IPv6 Host Address FEC Table
--

mplsFecIPv6HostAddrTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF MplsFecIPv6HostAddrEntry
    PIB-ACCESS      install
    STATUS          current
    DESCRIPTION
        "This table consists of MPLS IPv6 FEC entrees."

    ::= { mplsFecClasses 2 }

mplsFecIPv6HostAddrEntry OBJECT-TYPE
    SYNTAX          MplsFecIPv6HostAddrEntry
    STATUS          current
    DESCRIPTION
        "An instance of this class describes an IPv6 Host Address
        FEC. "

    PIB-INDEX { mplsFecIPv6HostAddrPrid }

    ::= { mplsFecIPv6HostAddrTable 1 }

MplsFecIPv6HostAddrEntry ::= SEQUENCE {
    mplsFecIPv6HostAddrPrid      InstanceId,
    mplsFecIPv6HostAddrIpAddr    InetAddressIPv6 }

mplsFecIPv6HostAddrPrid OBJECT-TYPE
    SYNTAX          InstanceId
    STATUS          current
    DESCRIPTION
        "An integer index that uniquely identifies an instance of
        the mplsFecIPv6HostAddrEntry class."

    ::= { mplsFecIPv6HostAddrEntry 1 }

mplsFecIPv6HostAddrIpAddr OBJECT-TYPE
    SYNTAX          InetAddressIPv6
    STATUS          current
    DESCRIPTION
        "IPv6 Host Address in a FEC."

    ::= { mplsFecIPv6HostAddrEntry 2 }
```

--
-- IPv4 Prefix FEC Table
--

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mplsFecIPv4PrefixTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsFecIPv4PrefixEntry

PIB-ACCESS install

STATUS current

DESCRIPTION

"This table consists of MPLS IPv4 Prefix FEC entrees."

::= { mplsFecClasses 3 }

mplsFecIPv4PrefixEntry OBJECT-TYPE

SYNTAX MplsFecIPv4PrefixEntry

STATUS current

DESCRIPTION

"An instance of this class describes a IPv4 Prefix FEC."

PIB-INDEX { mplsFecIPv4PrefixPrid }

::= { mplsFecIPv4PrefixTable 1 }

MplsFecIPv4PrefixEntry ::= SEQUENCE {

mplsFecIPv4PrefixPrid InstanceId,

mplsFecIPv4PrefixLength Unsigned32,

mplsFecIPv4PrefixIpPrefix InetAddressIPv4 }

mplsFecIPv4PrefixPrid OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of the mplsFecIPv4PrefixEntry class."

::= { mplsFecIPv4PrefixEntry 1 }

mplsFecIPv4PrefixLength OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Length of IPv4 Prefix in a FEC."

::= { mplsFecIPv4PrefixEntry 2 }

mplsFecIPv4PrefixIpPrefix OBJECT-TYPE

SYNTAX InetAddressIPv4

STATUS current

DESCRIPTION

"IPv4 Prefix in a FEC."

::= { mplsFecIPv4PrefixEntry 3 }

--
-- IPv6 Prefix FEC Table
--

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mplsFecIPv6PrefixTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsFecIPv6PrefixEntry

PIB-ACCESS install

STATUS current

DESCRIPTION

"This table consists of MPLS IPv6 Prefix FEC entrees."

::= { mplsFecClasses 4 }

mplsFecIPv6PrefixEntry OBJECT-TYPE

SYNTAX MplsFecIPv6PrefixEntry

STATUS current

DESCRIPTION

"An instance of this class describes a IPv6 Prefix FEC."

PIB-INDEX { mplsFecIPv6PrefixPrid }

::= { mplsFecIPv6PrefixTable 1 }

MplsFecIPv6PrefixEntry ::= SEQUENCE {

mplsFecIPv6PrefixPrid InstanceId,

mplsFecIPv6PrefixLength Unsigned32,

mplsFecIPv6PrefixIpPrefix InetAddressIPv6 }

mplsFecIPv6PrefixPrid OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of the mplsFecIPv6PrefixEntry class."

::= { mplsFecIPv6PrefixEntry 1 }

mplsFecIPv6PrefixLength OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Length of IPv6 Prefix in a FEC."

::= { mplsFecIPv6PrefixEntry 2 }

mplsFecIPv6PrefixIpPrefix OBJECT-TYPE

SYNTAX InetAddressIPv6

STATUS current

DESCRIPTION

"IPv6 Prefix in a FEC."

::= { mplsFecIPv6PrefixEntry 3 }

--

-- Autonomous System Number FEC Table

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--

mplsFecASTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsFecASEntry

PIB-ACCESS install

STATUS current

DESCRIPTION

"This table consists of MPLS Autonomous System Number FEC
entrees."

::= { mplsFecClasses 5 }

mplsFecASEntry OBJECT-TYPE

SYNTAX MplsFecASEntry

STATUS current

DESCRIPTION

"An instance of this class describes an Autonomous System
Number FEC. "

PIB-INDEX { mplsFecASPrId }

::= { mplsFecASTable 1 }

MplsFecASEntry ::= SEQUENCE {

mplsFecASPrId InstanceId,

mplsFecASNumber Unsigned32 }

mplsFecASPrId OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of
the mplsFecASEntry class."

::= { mplsFecASEntry 1 }

mplsFecASNumber OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Autonomous System Number in a FEC."

::= { mplsFecASEntry 2 }

--

-- Label Request Classes

--

```
mplsLabReqClasses OBJECT IDENTIFIER ::= { mplsSetupPib 2 }
```

```
--
```

```
-- Generic Label Request Table
```

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--

mplsLabReqGenericTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsLabReqGenericEntry

PIB-ACCESS install

STATUS current

DESCRIPTION

"This table consists of MPLS Generic Label Request Object
entrees."

::= { mplsLRClasses 1 }

mplsLabReqGenericEntry OBJECT-TYPE

SYNTAX MplsLabReqGenericEntry

STATUS current

DESCRIPTION

"An instance of this class describes MPLS Generic Label
Request Object. "

PIB-INDEX { mplsLabReqGenericPrid }

::= { mplsLabReqGenericTable 1 }

MplsLabReqGenericEntry ::= SEQUENCE {

mplsLabReqGenericPrid InstanceId,

mplsLabReqGenericL3Pid Unsigned32 }

mplsLabReqGenericPrid OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of
the mplsLabReqGenericEntry class."

::= { mplsLabReqGenericEntry 1 }

mplsLabReqGenericL3Pid OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Layer 3 Protocol Id in MPLS Generic Label Request
Object."

::= { mplsLabReqGenericEntry 2 }

--

-- ATM Label Request Table

--

mplsLabReqATMTable	OBJECT-TYPE
SYNTAX	SEQUENCE OF MplsLabReqATMEntry
PIB-ACCESS	install

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STATUS current

DESCRIPTION

"This table consists of MPLS ATM Label Request Object entrees."

::= { mplsLabReqClasses 1 }

mplsLabReqATMEntry OBJECT-TYPE

SYNTAX MplsLabReqATMEntry

STATUS current

DESCRIPTION

"An instance of this class describes MPLS ATM Label Request Object. "

PIB-INDEX { mplsLabReqATMPrid }

::= { mplsLabReqATMTable 1 }

MplsLabReqATMEntry ::= SEQUENCE {

mplsLabReqATMPrid	InstanceId,
mplsLabReqATML3Pid	Unsigned32,
mplsLabReqATMMbit	Unsigned32,
mplsLabReqATMMinVpi	Unsigned32,
mplsLabReqATMMaxVpi	Unsigned32,
mplsLabReqATMMinVci	Unsigned32,
mplsLabReqATMMaxVci	Unsigned32 }

mplsLabReqATMPrid OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of the mplsLabReqATMEntry class."

::= { mplsLabReqATMEntry 1 }

mplsLabReqATML3Pid OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Layer 3 Protocol Id in MPLS ATM Label Request Object."

::= { mplsLabReqATMEntry 2 }

mplsLabReqATMMbit OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Merging Capable Bit in MPLS ATM Label Request Object."

::= { mplsLabReqATMEntry 3 }

```
mplsLabReqATMinVpi OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Minimum value for VPI in MPLS ATM Label Request Object."

    ::= { mplsLabReqATMEntry 4 }

mplsLabReqATMaxVpi OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Maximum value for VPI in MPLS ATM Label Request Object."

    ::= { mplsLabReqATMEntry 5 }

mplsLabReqATMinVci OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Minimum value for VCI in MPLS ATM Label Request Object."

    ::= { mplsLabReqATMEntry 6 }

mplsLabReqATMaxVci OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Maximum value for VCI in MPLS ATM Label Request Object."

    ::= { mplsLabReqATMEntry 7 }

--
-- Frame Relay Label Request Table
--

mplsLabReqFRTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF MplsLabReqFREntry
    PIB-ACCESS   install
    STATUS      current
    DESCRIPTION
        "This table consists of MPLS Frame Relay Label Request
        Object entrees."

    ::= { mplsLabReqClasses 1 }

mplsLabReqFREntry OBJECT-TYPE
    SYNTAX      MplsLabReqFREntry
```

STATUS current

DESCRIPTION

"An instance of this class describes MPLS Frame Relay
Label Request Object. "

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```
PIB-INDEX { mplsLabReqFRPrId }

::= { mplsLabReqFRTable 1 }

MplsLabReqFREntry ::= SEQUENCE {
    mplsLabReqFRPrId      InstanceId,
    mplsLabReqFRL3Pid     Unsigned32,
    mplsLabReqFRDlciLen   Unsigned32,
    mplsLabReqFRMinDlci   Unsigned32,
    mplsLabReqFRMaxDlci   Unsigned32}

mplsLabReqFRPrId OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current
    DESCRIPTION
        "An integer index that uniquely identifies an instance of
        the mplsLabReqFREntry class."

    ::= { mplsLabReqFREntry 1 }

mplsLabReqFRL3Pid OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Layer 3 Protocol Id in MPLS Frame Relay Label Request
        Object."

    ::= { mplsLabReqFREntry 2 }

mplsLabReqFRDlciLen OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Length of DLCI in MPLS Frame Relay Label Request Object."

    ::= { mplsLabReqFREntry 3 }

mplsLabReqFRMinDlci OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Minimum value DLCI in MPLS Frame Relay Label Request
        Object."

    ::= { mplsLabReqFREntry 4 }

mplsLabReqFRMaxDlci OBJECT-TYPE
    SYNTAX      Unsigned32
```

STATUS current

DESCRIPTION

"Maximum value DLCI in MPLS Frame Relay Label Request
Object."

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```
 ::= { mplsLabReqFREntry 5 }

--
-- Flow (Traffic) Specification Classes
--

mplsFlowSpecClasses OBJECT IDENTIFIER ::= { mplsSetupPib 3 }

--
-- CRLDP Flow Spec Table
--

mplsFlowSpecCRLDPTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF MplsFlowSpecCRLDPEntry
    PIB-ACCESS      install
    STATUS          current
    DESCRIPTION
        "This table consists of CR-LDP Traffic (Flow) Specification
        entrees."

    ::= { mplsFlowSpecClasses 1 }

mplsFlowSpecCRLDPEntry OBJECT-TYPE
    SYNTAX          MplsFlowSpecCRLDPEntry
    STATUS          current
    DESCRIPTION
        "An instance of this class describes a CR-LDP Flow
        Specification. "

    PIB-INDEX { mplsFlowSpecCRLDPPrid }

    ::= { mplsFlowSpecCRLDPTable 1 }

MplsFlowSpecCRLDPEntry ::= SEQUENCE {
    mplsFlowSpecCRLDPPrid      InstanceId,
    mplsFlowSpecCRLDPPDR      Unsigned32,
    mplsFlowSpecCRLDPPBS      Unsigned32,
    mplsFlowSpecCRLDPCDR      Unsigned32,
    mplsFlowSpecCRLDPCBS      Unsigned32,
    mplsFlowSpecCRLDPEBS      Unsigned32,
    mplsFlowSpecCRLDPWeight   Unsigned32 }

mplsFlowSpecCRLDPPrid OBJECT-TYPE
    SYNTAX          InstanceId
    STATUS          current
    DESCRIPTION
        "An integer index that uniquely identifies an instance of
```

the mplsFlowSpecCRLDPEntEntry class."

::= { mplsFlowSpecCRLDPEntEntry 1 }

mplsFlowSpecCRLDPPDR OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Peak Data Rate in CR-LDP Flow Specification."

::= { mplsFlowSpecCRLDPEnt 2 }

mplsFlowSpecCRLDPPBS OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Peak Burst Size in CR-LDP Flow Specification."

::= { mplsFlowSpecCRLDPEnt 3 }

mplsFlowSpecCRLDPCDR OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Committed Data Rate in CR-LDP Flow Specification."

::= { mplsFlowSpecCRLDPEnt 4 }

mplsFlowSpecCRLDPCBS OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Committed Burst Size in CR-LDP Flow Specification."

::= { mplsFlowSpecCRLDPEnt 5 }

mplsFlowSpecCRLDPEBS OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Excess Burst Size in CR-LDP Flow Specification."

::= { mplsFlowSpecCRLDPEnt 6 }

mplsFlowSpecCRLDPWeight OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Weight parameter in CR-LDP Flow Specification."

::= { mplsFlowSpecCRLDPEnt 7 }

--
-- RSVP Controlled Load Service Flow Spec Table
--

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mplsFlowSpecCLSTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsFlowSpecCLSEntry
PIB-ACCESS install
STATUS current
DESCRIPTION
"This table consists of RSVP-TE Integrated Services
(IntServ) Controlled Load Service Flow Specification
entrees."

::= { mplsFlowSpecClasses 2 }

mplsFlowSpecCLSEntry OBJECT-TYPE

SYNTAX MplsFlowSpecCLSEntry
STATUS current
DESCRIPTION
"An instance of this class describes RSVP-TE IntServ
Controlled Load Service Flow Specification. "

PIB-INDEX { mplsFlowSpecCLSPrid }

::= { mplsFlowSpecCLSTable 1 }

MplsFlowSpecCLSEntry ::= SEQUENCE {

mplsFlowSpecCLSPrid InstanceId,
mplsFlowSpecCLSTokenRate Unsigned32,
mplsFlowSpecCLSBucketSize Unsigned32,
mplsFlowSpecCLSPeakRate Unsigned32,
mplsFlowSpecCLSMInPoliced Unsigned32,
mplsFlowSpecCLSMaXpktSize Unsigned32 }

mplsFlowSpecCLSPrid OBJECT-TYPE

SYNTAX InstanceId
STATUS current
DESCRIPTION
"An integer index that uniquely identifies an instance of
the mplsFlowSpecCLSEntry class."

::= { mplsFlowSpecCLSEntry 1 }

mplsFlowSpecCLSTokenRate OBJECT-TYPE

SYNTAX Unsigned32
STATUS current
DESCRIPTION
"Token Rate in RSVP-TE IntServ Controlled Load Service
Flow Specification."

::= { mplsFlowSpecCLSEntry 2 }

mplsFlowSpecCLSBucketSize OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

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"Token Bucket Size in RSVP-TE IntServ Controlled Load
Service Flow Specification."

::= { mplsFlowSpecCLSEntry 3 }

mplsFlowSpecCLSPeakRate OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Peak Rate in RSVP-TE IntServ Controlled Load Service
Flow Specification."

::= { mplsFlowSpecCLSEntry 4 }

mplsFlowSpecCLSMInPoliced OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Minimum Policed Packet Size in RSVP-TE IntServ Controlled
Load Service Flow Specification."

::= { mplsFlowSpecCLSEntry 5 }

mplsFlowSpecCLSMaXpktSize OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Maximum Packet Size in RSVP-TE IntServ Controlled Load
Service Flow Specification."

::= { mplsFlowSpecCLSEntry 6 }

--

-- RSVP Guaranteed Service Flow Spec Table

--

mplsFlowSpecGStable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsFlowSpecGSEntry

PIB-ACCESS install

STATUS current

DESCRIPTION

"This table consists of RSVP-TE Integrated Services
(IntServ) Guaranteed Service Flow Specification entrees."

::= { mplsFlowSpecClasses 3 }

mplsFlowSpecGSEntry OBJECT-TYPE

SYNTAX MplsFlowSpecGSEntry

STATUS current

DESCRIPTION

"An instance of this class describes RSVP-TE IntServ

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Guaranteed Service Flow Specification. "

PIB-INDEX { mplsFlowSpecGSPrid }

::= { mplsFlowSpecGSTable 1 }

MplsFlowSpecGSEntry ::= SEQUENCE {
 mplsFlowSpecGSPrid InstanceId,
 mplsFlowSpecGSTokenRate Unsigned32,
 mplsFlowSpecGSBucketSize Unsigned32,
 mplsFlowSpecGSPeakRate Unsigned32,
 mplsFlowSpecGSMinPoliced Unsigned32,
 mplsFlowSpecGSMaxPktSize Unsigned32,
 mplsFlowSpecGSRspecRate Unsigned32,
 mplsFlowSpecGSSlackTerm Unsigned32 }

mplsFlowSpecGSPrid OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of
the mplsFlowSpecGSEntry class."

::= { mplsFlowSpecGSEntry 1 }

mplsFlowSpecGSTokenRate OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Token Rate in RSVP-TE IntServ Guaranteed Service
Flow Specification."

::= { mplsFlowSpecGSEntry 2 }

mplsFlowSpecGSBucketSize OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Token Bucket Size in RSVP-TE IntServ Guaranteed
Service Flow Specification."

::= { mplsFlowSpecGSEntry 3 }

mplsFlowSpecGSPeakRate OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Peak Rate in RSVP-TE IntServ Guaranteed Service
Flow Specification."

::= { mplsFlowSpecGSEntry 4 }

mplsFlowSpecGSEntry OBJECT-TYPE

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```
SYNTAX      Unsigned32
STATUS      current
DESCRIPTION
    "Minimum Policed Packet Size in RSVP-TE IntServ Guaranteed
    Service Flow Specification."

::= { mplsFlowSpecGSEntry 5 }

mplsFlowSpecGSMaXpktSize OBJECT-TYPE
SYNTAX      Unsigned32
STATUS      current
DESCRIPTION
    "Maximum Packet Size in RSVP-TE IntServ Guaranteed
    Service Flow Specification."

::= { mplsFlowSpecGSEntry 6 }

mplsFlowSpecGSRspecRate OBJECT-TYPE
SYNTAX      Unsigned32
STATUS      current
DESCRIPTION
    "Required Rate in RSVP-TE IntServ Guaranteed Service
    Flow Specification."

::= { mplsFlowSpecGSEntry 7 }

mplsFlowSpecGSSlackTerm OBJECT-TYPE
SYNTAX      Unsigned32
STATUS      current
DESCRIPTION
    "Slack Term (Delay) in RSVP-TE IntServ Guaranteed Service
    Flow Specification."

::= { mplsFlowSpecGSEntry 8 }

--
-- Explicit Route Object (ERO) Classes
--

mplsEroClasses OBJECT IDENTIFIER ::= { mplsSetupPib 4 }

--
-- IPv4 Address Prefix Subobject Table
--

mplsEroIPv4PrefixTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsEroIPv4PrefixEntry
PIB-ACCESS  install
```

STATUS current

DESCRIPTION

"This table consists of MPLS IPv4 Prefix ERO Subobject
Entrees."

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```
 ::= { mplsEroClasses 1 }

mplsEroIPv4PrefixEntry OBJECT-TYPE
    SYNTAX      MplsEroIPv4PrefixEntry
    STATUS      current
    DESCRIPTION
        "An instance of this class describes IPv4 Prefix ERO
        Subobject. "

    PIB-INDEX { mplsEroIPv4PrefixPrid }

 ::= { mplsEroIPv4PrefixTable 1 }

MplsEroIPv4PrefixEntry ::= SEQUENCE {
    mplsEroIPv4PrefixPrid      InstanceId,
    mplsEroIPv4PrefixLen       Unsigned32,
    mplsEroIPv4PrefixIPv4Addr  InetAddressIPv4 }

mplsEroIPv4PrefixPrid OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current
    DESCRIPTION
        "An integer index that uniquely identifies an instance of
        the mplsEroIPv4PrefixEntry class."

 ::= { mplsEroIPv4PrefixEntry 1 }

mplsEroIPv4PrefixLen OBJECT-TYPE
    SYNTAX      Unsigned32
    STATUS      current
    DESCRIPTION
        "Length of Prefix in IPv4 Prefix ERO Subobject."

 ::= { mplsEroIPv4PrefixEntry 2 }

mplsEroIPv4PrefixIPv4Addr OBJECT-TYPE
    SYNTAX      InetAddress
    STATUS      current
    DESCRIPTION
        "IPv4 Prefix in IPv4 Prefix ERO Subobject."

 ::= { mplsEroIPv4PrefixEntry 3 }

--
-- IPv6 Address Prefix Subobject Table
--
```

mplsEroIPv6PrefixTable OBJECT-TYPE

SYNTAX	SEQUENCE OF MplsEroIPv6PrefixEntry
PIB-ACCESS	install
STATUS	current

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DESCRIPTION

"This table consists of MPLS IPv6 Prefix ERO Subobject
Entrees."

::= { mplsEroClasses 2 }

mplsEroIPv6PrefixEntry OBJECT-TYPE

SYNTAX MplsEroIPv6PrefixEntry

STATUS current

DESCRIPTION

"An instance of this class describes IPv6 Prefix ERO
Subobject. "

PIB-INDEX { mplsEroIPv6PrefixPrid }

::= { mplsEroIPv6PrefixTable 1 }

MplsEroIPv6PrefixEntry ::= SEQUENCE {

mplsEroIPv6PrefixPrid InstanceId,

mplsEroIPv6PrefixLen Unsigned32,

mplsEroIPv6PrefixIPv6Addr InetAddressIPv6 }

mplsEroIPv6PrefixPrid OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of
the mplsEroIPv6PrefixEntry class."

::= { mplsEroIPv6PrefixEntry 1 }

mplsEroIPv6PrefixLen OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Length of Prefix in IPv6 Prefix ERO Subobject."

::= { mplsEroIPv6PrefixEntry 2 }

mplsEroIPv6PrefixIPv6Addr OBJECT-TYPE

SYNTAX InetAddress

STATUS current

DESCRIPTION

"IPv6 Prefix in IPv6 Prefix ERO Subobject."

::= { mplsEroIPv6PrefixEntry 3 }

-- Autonomous System Number Subobject Table
--

mplsEroASNumberTable OBJECT-TYPE

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```
SYNTAX          SEQUENCE OF MplsEroASNumberEntry
PIB-ACCESS      install
STATUS          current
DESCRIPTION
    "This table consists of MPLS Autonomous System Number ERO
    Subobject Entrees."

::= { mplsEroClasses 3 }

mplsEroASNumberEntry OBJECT-TYPE
SYNTAX          MplsEroASNumberEntry
STATUS          current
DESCRIPTION
    "An instance of this class describes Autonomous System
    Number ERO Subobject. "

PIB-INDEX { mplsEroASNumberPrid }

::= { mplsEroASNumberTable 1 }

MplsEroASNumberEntry ::= SEQUENCE {
    mplsEroASNumberPrid      InstanceId,
    mplsEroASNumberASNumber  Unsigned32}

mplsEroASNumberPrid OBJECT-TYPE
SYNTAX          InstanceId
STATUS          current
DESCRIPTION
    "An integer index that uniquely identifies an instance of
    the mplsEroASNumberEntry class."

::= { mplsEroASNumberEntry 1 }

mplsEroASNumberASNumber OBJECT-TYPE
SYNTAX          Unsigned32
STATUS          current
DESCRIPTION
    "Autonomous System Number in Autonomous System Number
    Subobject."

::= { mplsEroASNumberEntry 2 }

--
-- ERO Table
--

mplsEroTable OBJECT-TYPE
SYNTAX          SEQUENCE OF MplsEroEntry
PIB-ACCESS      install
```

STATUS current

DESCRIPTION

"This table consists of MPLS ERO Subobject Entrees."

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```
::= { mplsEroClasses 4 }
```

mplsEroEntry OBJECT-TYPE

SYNTAX MplsEroEntry

STATUS current

DESCRIPTION

"An instance of this class describes ERO Subobject."

PIB-INDEX { mplsEroPrid }

```
::= { mplsEroTable 1 }
```

MplsEroEntry ::= SEQUENCE {

mplsEroPrid InstanceId,

mplsEroLoose Unsigned32,

mplsEroSubObject Prid }

mplsEroPrid OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of the mplsEroEntry class."

```
::= { mplsEroEntry 1 }
```

mplsEroLoose OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Loose Bit in ERO Subobject."

```
::= { mplsEroEntry 2 }
```

mplsEroSubObject OBJECT-TYPE

SYNTAX Prid

STATUS current

DESCRIPTION

"This points to an instance of one type of ERO subobject. It could be an instance of mplsEroIpv4PrefixEntry, mplsEroIpv6PrefixEntry or mplsEroASNumberEntry."

```
::= { mplsEroEntry 3 }
```

--

-- Ero Group Table

--

mplsEroGroupTable	OBJECT-TYPE
SYNTAX	SEQUENCE OF MplsEroGroupEntry
PIB-ACCESS	install
STATUS	current

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DESCRIPTION

"This table defines ERO Subobject groups. Each group then is used in an LSP definition. Grouping is done using a TagId and order of Subobject in a group is provided by using a precedence number."

::= { mplsEroClasses 5 }

mplsEroGroupEntry OBJECT-TYPE

SYNTAX MplsEroGroupEntry

STATUS current

DESCRIPTION

"An instance of ERO Subobject group."

PIB-INDEX { mplsEroGroupPrid }

::= { mplsEroGroupTable 1 }

MplsEroGroupEntry ::= SEQUENCE {

mplsEroGroupPrid	InstanceId,
mplsEroGroupId	TagId,
mplsEroGroupIdPrecedence	Unsigned32,
mplsEroGroupEroId	ReferenceId }

mplsEroGroupPrid OBJECT-TYPE

SYNTAX InstanceId

STATUS current

DESCRIPTION

"An integer index that uniquely identifies an instance of the mplsEroGroupEntry class."

::= { mplsEroGroupEntry 1 }

mplsEroGroupId OBJECT-TYPE

SYNTAX TagId

STATUS current

DESCRIPTION

"Tag Id (number) used to group multiple entries in this table."

::= { mplsEroGroupEntry 2 }

mplsEroGroupIdPrecedence OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"This is used to provide ordering for entries with the same Tag Id."

::= { mplEroGroupEntry 3 }

mplEroGroupEroId OBJECT-TYPE
SYNTAX ReferenceId

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```
PIB-REFERENCES { mplsEroEntry }
STATUS          current
DESCRIPTION
    "Pointer to an instance of ERO Subobject. The ERO Subobject
    with the same Id must be present."

::= { mplsEroGroupEntry 4 }

--
-- Preemption Classes
--

mplsPreemptionClasses OBJECT IDENTIFIER ::= { mplsSetupPib 5 }

--
-- Preemption Table
--

mplsPreemptionTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF MplsPreemptionEntry
    PIB-ACCESS       install
    STATUS           current
    DESCRIPTION
        "This table consists of LSP Preemption Entrees."

    ::= { mplsFlowSpecClasses 1 }

mplsPreemptionEntry OBJECT-TYPE
    SYNTAX          MplsPreemptionEntry
    STATUS           current
    DESCRIPTION
        "An instance of this class describes a LSP Preemption
        object. "

    PIB-INDEX { mplsPreemptionPrid }

    ::= { mplsPreemptionTable 1 }

MplsPreemptionEntry ::= SEQUENCE {
    mplsPreemptionPrid      InstanceId,
    mplsPreemptionSetupPrio Unsigned32,
    mplsPreemptionHoldPrio  Unsigned32 }

mplsPreemptionPrid OBJECT-TYPE
    SYNTAX          InstanceId
    STATUS           current
    DESCRIPTION
        "An integer index that uniquely identifies an instance of
```

the mplsPreemptionEntry class."

:= { mplsPreemptionEntry 1 }

mplsPreemptionSetupPrio OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Indicates MPLS LSP Setup Priority."

::= { mplsPreemptionEntry 2 }

mplsPreemptionHoldPrio OBJECT-TYPE

SYNTAX Unsigned32

STATUS current

DESCRIPTION

"Indicates MPLS LSP Holding Priority."

::= { mplsPreemptionEntry 3 }

--

-- LSP Setup Classes

--

mplsLspClasses OBJECT IDENTIFIER ::= { mplsSetupPib 6 }

--

-- LSP Table

--

mplsLspTable OBJECT-TYPE

SYNTAX SEQUENCE OF MplsLspEntry

PIB-ACCESS install

STATUS current

DESCRIPTION

"This table consists of MPLS LSP Entries. Entries in this table essentially point to instances of other PRCs such as FEC, Label Request, ERO, Flow Spec and Preemption to form complete LSPs."

::= { mplsLspClasses 1 }

mplsLspEntry OBJECT-TYPE

SYNTAX MplsLspEntry

STATUS current

DESCRIPTION

"An instance of MPLS LSP. "

PIB-INDEX { mplsLspPrid }

```
::= { mplsLspTable 1 }
```

```
MplsLspEntry ::= SEQUENCE {  
    mplsLspPrid      InstanceId,
```



```
mplsLspFec      Prid,  
mplsLspLabReq   Prid,  
mplsLspFlowSpec Prid,  
mplsLspPreemption ReferenceId,  
mplsLspEroList  TagReference }
```

mplsLspPrid OBJECT-TYPE

```
SYNTAX      InstanceId  
STATUS      current
```

DESCRIPTION

"An integer index that uniquely identifies an instance of the mplsLspEntry class."

::= { mplsLspEntry 1 }

mplsLspFec OBJECT-TYPE

```
SYNTAX      Prid  
STATUS      current
```

DESCRIPTION

"This points to an instance of one type of FEC. It could be an instance of mplsFecIPv4HostAddrEntry, mplsFecIPv6HostAddrEntry, mplsFecIPv4PrefixEntry, mplsFecIPv6PrefixEntry, mplsFecASEntry."

::= { mplsLspEntry 2 }

mplsLspLabReq OBJECT-TYPE

```
SYNTAX      Prid  
STATUS      current
```

DESCRIPTION

"This points to an instance of one type of Label Request Object. It could be an instance of mplsLabReqGenericEntry, mplsLabReqATMEntry, mplsLabReqFREntry."

::= { mplsLspEntry 3 }

mplsLspFlowSpec OBJECT-TYPE

```
SYNTAX      Prid  
STATUS      current
```

DESCRIPTION

"This points to an instance of one type of FlowSpec. It could be an instance of mplsFlowSpecCRLDPEntry, mplsFlowSpecCLSEntry, mplsFlowSpecGSEntry."

::= { mplsLspEntry 4 }

mplsLspPreemption OBJECT-TYPE

```
SYNTAX      ReferenceId  
PIB-REFERENCES { mplsPreemptionEntry }
```

STATUS current

DESCRIPTION

"This points to an instance of mplsPreemptionEntry."

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```
::= { mplsLspEntry 5 }
```

```
mplsLspEroList OBJECT-TYPE
```

```
SYNTAX          TagReference
```

```
PIB-TAG          { mplsEroGroupId }
```

```
STATUS           current
```

```
DESCRIPTION
```

```
    "This references a Tag Id attribute in mplsEroGroup table.
```

```
    All the entries in mplsEroGroup table that have this Tag Id
```

```
    form the ERO List that is used for this LSP entry."
```

```
::= { mplsLspEntry 6 }
```

```
-- Compliance section
```

```
-- TBD
```

5. Security Considerations

The information contained in a PIB when transported by the COPS protocol [[COPS-PR](#)] may be sensitive, and its function of provisioning a PEP requires that only authorized communication take place. COPS provides an Integrity mechanism for its messages that achieves authentication and integrity of all messages exchanged between PEP and PDP. The use of IPSEC between PDP and PEP, as described in [[COPS](#)], which is optional, provides additional protection in the form of confidentiality. For a more detailed description of security considerations relevant to PIBs, please see [[FR-PIB](#)].

6. Intellectual Property Considerations

The IETF is being notified of intellectual property rights claimed in regard to some or all of the specification contained in this document. For more information consult the online list of claimed rights.

7. Acknowledgements

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