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**Generalized Multiprotocol Label Switching (GMPLS)  
Label Switching Router (LSR) Management Information Base**

[draft-ietf-ccamp-gmpls-lsr-mib-15.txt](#)

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects to configure and/or monitor a Generalized Multiprotocol Label Switching (GMPLS) Label Switching Router (LSR).

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## **[1. Introduction](#)**

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling a Generalized Multiprotocol Label Switching (GMPLS) [[RFC3945](#)] Label Switching Router (LSR).

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 [BCP 14](#), [RFC 2119](#), reference [[RFC2119](#)].

### **[1.1. Migration Strategy](#)**

MPLS LSRs may be modeled and managed using the MPLS-LSR-STD-MIB module [[RFC3813](#)].

LSRs may be migrated to be modeled and managed using the MIB modules in this document in order to migrate the LSRs to GMPLS support, or to take advantage of additional MIB objects defined in these MIB modules that are applicable to MPLS-TE.



The GMPLS LSR MIB module (GMPLS-LSR-STD-MIB) defined in this document extends the MPLS-LSR-STD-MIB module [[RFC3813](#)] through a series of sparse augmentations of the MIB tables. The only additions are for support of GMPLS or to support the increased complexity of MPLS and GMPLS systems.

In order to migrate from MPLS-LSR-STD-MIB support to GMPLS-LSR-STD-MIB support an implementation needs only to add support for the additional tables and objects defined in GMPLS-LSR-STD-MIB. The `gmplsInterfaceSignalingCaps` object allows an implementation to use the objects and tables of GMPLS-LSR-STD-MIB without supporting the GMPLS protocols.

The GMPLS Label MIB module (GMPLS-LABEL-STD-MIB) also defined in this document allows labels to be configured and examined, and supports more varieties of label as appropriate for GMPLS. Labels may be referenced using a row pointer from objects within the GMPLS-LSR-STD-MIB module. MPLS implementations (MPLS-LSR-STD-MIB) may also reference labels held in the GMPLS-LABEL-STD-MIB module through the various label pointer objects in the MPLS-LSR-STD-MIB module (such as `mplsInSegmentLabelPtr`), and may do so without implementing the GMPLS-LSR-STD-MIB module.

The companion document modeling and managing GMPLS based traffic engineering [[GMPLSTEMIB](#)] extends the MPLS-TE-STD-MIB module [[RFC3812](#)] with the same intentions.

Textual conventions are defined in [[GMPLSTCMIB](#)] which extends the set of textual conventions originally defined in [[RFC3811](#)].

## 2. Terminology

This document uses terminology from the document describing the MPLS architecture [[RFC3031](#)] and the GMPLS architecture [[RFC3945](#)].

A label switched path (LSP) is modeled as a connection consisting of one or more incoming segments (in-segments) and/or one or more outgoing segments (out-segments) at an LSR. The association or interconnection of the in-segments and out-segments is accomplished by using a cross-connect. We use the terminology "connection" and "LSP" interchangeably where the meaning is clear from the context.

|               |                                                                                                                                                                                                                                                                   |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| in-segment    | This is analogous to a GMPLS label on an interface.                                                                                                                                                                                                               |
| out-segment   | This is analogous to a GMPLS label on an interface.                                                                                                                                                                                                               |
| cross-connect | This describes the conceptual connection between a set of in-segments and out-segments. Note that either set may be empty; for example, a cross-connect may connect only out-segments together with no in-segments in the case where an LSP originates on an LSR. |



The terms 'ingress' and 'head-end' (or 'head') are used in this document to indicate the signaling source of an LSP. This is sometimes also referred to as the 'sender'.

The terms 'egress' and 'tail-end' (or 'tail') are used in this document to indicate the signaling destination of an LSP.

The term 'upstream' is used in this document to refer to the part of an LSP closer to the ingress than the current point of reference.

The term 'downstream' is used in this document to refer to the part of an LSP closer to the egress than the current point of reference.

The term 'forward' is used in this document to indicate the direction of data flow from the ingress toward the egress.

The term 'reverse' is used in this document to indicate the direction of data flow from the egress toward the ingress.

### **3. 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](#)].

### **4. Outline**

#### **4.1 MIB Modules**

There are two MIB modules defined in this document.

The GMPLS-LSR-STD-MIB module contains tables that sparse augment tables defined in the MPLS-LSR-STD-MIB module [[RFC3813](#)]. This MIB module is used in conjunction with the MPLS-LSR-STD-MIB module [[RFC3813](#)] in systems that support GMPLS.

The GMPLS-LABEL-STD-MIB module contains objects for managing GMPLS labels when they cannot be represented using the textual conventions of the MPLS-TC-STD-MIB module [[RFC3811](#)], or when more detailed access to the sub-fields of the labels is required.



#### **[4.1.1](#) Summary of the GMPLS-LSR-STD-MIB Module**

The MIB tables in the GMPLS-LSR-STD-MIB module are as follows.

- The interface configuration table (gmplsInterfaceTable), which sparse augments the mplsInterfaceTable [[RFC3813](#)] to enable the GMPLS protocol on MPLS-capable interfaces.
- The in-segment (gmplsInSegmentTable) and out-segment (gmplsOutSegmentTable) tables sparse augment mplsInSegmentTable and mplsOutSegmentTable [[RFC3813](#)] to enable configuration of GMPLS-specific parameters for LSP segments at an LSR.

These tables are described in the subsequent sections.

#### **[4.1.2](#) Summary of the GMPLS-LABEL-STD-MIB Module**

There is one MIB table in the GMPLS-LABEL-STD-MIB module as follows.

- The gmplsLabelTable allows Generalized Labels to be defined and managed in a central location. Generalized Labels can be of variable length and have distinct bit-by-bit interpretations depending upon how they are defined for the specific technology in which they are used. For example, labels used for MPLS packet switching are different in length and content from labels used in TDM timeslot switching.

### **[4.2.](#) Configuring Statically Provisioned LSPs**

Configuring statically provisioned GMPLS LSPs through an LSR involves the following steps:

- Configuring an interface using the MPLS-LSR-STD-MIB module [[RFC3813](#)].
- Enabling GMPLS on GMPLS capable interfaces using the GMPLS-LSR-STD-MIB module in this document.
- Configuring in and out-segments using the MPLS-LSR-STD-MIB module [[RFC3813](#)].
- Configuring GMPLS extensions to the in-segments and out-segments using the GMPLS-LSR-STD-MIB module in this document.
- Setting up the cross-connect table in the MPLS-LSR-STD-MIB module [[RFC3813](#)] to associate segments and/or to indicate connection origination and termination.



- Optionally setting up labels in the label table in the GMPLS-LABEL-STD-MIB module in this document if the textual convention MplsLabel [[RFC3811](#)] is not capable of holding the required label (for example, if the label requires more than 32 bits to encode it), or if the operator wishes to disambiguate GMPLS label types.
- Optionally specifying label stack actions in the MPLS-LSR-STD-MIB module [[RFC3813](#)].
- Optionally specifying segment traffic parameters in the MPLS-LSR-STD-MIB module [[RFC3813](#)].

## 5. Bidirectional LSPs

The GMPLS-LSR-STD-MIB module supports bidirectional LSPs as required for GMPLS. A single value of mplsXCIndex is shared by all of the segments for the entire bidirectional LSP. This facilitates a simple reference from [[RFC3812](#)] and [[GMPLSTEMIB](#)], and makes fate-sharing more obvious.

It is, however, important that the direction of segments is understood to avoid connecting all in-segments to all out-segments. This is achieved by an object in each segment that indicates the direction of the segment with respect to data flow.

A segment that is marked as 'forward' carries data from the 'head' of the LSP to the 'tail'. A segment marked as 'reverse' carries data in the reverse direction.

Where an LSP is signaled using a conventional signaling protocol, the 'head' of the LSP is the source of the signaling (also known as the ingress) and the 'tail' is the destination (also known as the egress). For manually configured LSPs an arbitrary decision must be made about which segments are 'forward' and which 'reverse'. For consistency this decision should be made across all LSRs that participate in the LSP by assigning 'head' and 'tail' ends to the LSP.

## 6. Example of LSP Setup

In this section we provide a brief example of using the MIB objects described in sections [7](#) and [8](#) to set up an LSP. While this example is not meant to illustrate every nuance of the MIB modules, it is intended as an aid to understanding some of the key concepts. It is meant to be read after going through the MIB modules themselves. A prerequisite is an understanding of the MPLS-LSR-STD-MIB [[RFC3813](#)].

Suppose that one would like to manually create a best-effort, bi-directional LSP. Assume that, in the forward direction, the LSP



enters the LSR via MPLS interface A with ifIndex 12 and exits the LSR via MPLS interface B with ifIndex 13. For the reverse direction, we assume the LSP enters via interface B and leaves via interface A (i.e. the forward and reverse directions use the same bi-directional interfaces). Let us also assume that we do not wish to have a label stack beneath the top label on the outgoing labeled packets. The following example illustrates which rows and corresponding objects might be created to accomplish this.

We must first create rows in the `gmplsLabelTable` corresponding to the labels required for each of the forward and reverse direction in- and out-segments. For the purpose of this example the forward and reverse labels on each interface will be the same, hence we need to create just two rows in the `gmplsLabelTable` - one for each interface.

In `gmplsLabelTable`:

```
{
  gmplsLabelInterface      = 12,
  gmplsLabelIndex          = 1,
  gmplsLabelSubindex       = 0,
  gmplsLabelType           = gmplsFreeformLabel(3),
  gmplsLabelFreeform       = 0x123456789ABCDEF0
  gmplsLabelRowStatus      = createAndGo(4)
}
```

In `gmplsLabelTable`:

```
{
  gmplsLabelInterface      = 13,
  gmplsLabelIndex          = 1,
  gmplsLabelSubindex       = 0,
  gmplsLabelType           = gmplsFreeformLabel(3),
  gmplsLabelFreeform       = 0xFEDCBA9876543210
  gmplsLabelRowStatus      = createAndGo(4)
}
```

We must next create the appropriate in-segment and out-segment entries. These are done in [[RFC3813](#)] using the `mplsInSegmentTable` and `mplsOutSegmentTable`. Note that we use a row pointer to the two rows in the `gmplsLabelTable` rather than specifying the labels explicitly in the in- and out-segment tables. Also note that the row status for each row is set to `createAndWait(5)` to allow corresponding entries in the `gmplsInSegmentTable` and `gmplsOutSegmentTable` to be created.



For the forward direction.

In mplInSegmentTable:

```
{
    mplInSegmentIndex          = 0x00000015
    mplInSegmentLabel          = 0, -- incoming label in label table
    mplInSegmentNPop           = 1,
    mplInSegmentInterface      = 12, -- incoming interface
    -- RowPointer MUST point to the first accessible column.
    mplInSegmentTrafficParamPtr = 0.0,
    mplInSegmentLabelPtr       = gmplsLabelTable (12, 1, 0)
    mplInSegmentRowStatus      = createAndWait(5)
}
```

In mplOutSegmentTable:

```
{
    mplOutSegmentIndex          = 0x00000012,
    mplOutSegmentInterface      = 13, -- outgoing interface
    mplOutSegmentPushTopLabel   = true(1),
    mplOutSegmentTopLabel       = 0, -- outgoing label in label table

    -- RowPointer MUST point to the first accessible column.
    mplOutSegmentTrafficParamPtr = 0.0,
    mplOutSegmentLabelPtr       = gmplsLabelTable (13, 1, 0)
    mplOutSegmentRowStatus      = createAndWait(5)
}
```

For the reverse direction.

In mplInSegmentTable:

```
{
    mplInSegmentIndex          = 0x00000016

    mplInSegmentLabel          = 0, -- incoming label in label table
    mplInSegmentNPop           = 1,
    mplInSegmentInterface      = 13, -- incoming interface

    -- RowPointer MUST point to the first accessible column.
    mplInSegmentTrafficParamPtr = 0.0,
    mplInSegmentLabelPtr       = gmplsLabelTable (13, 1, 0)

    mplInSegmentRowStatus      = createAndWait(5)
}
```



In mplsOutSegmentTable:

```
{
    mplsOutSegmentIndex          = 0x00000013,
    mplsOutSegmentInterface      = 12, -- outgoing interface
    mplsOutSegmentPushTopLabel   = true(1),
    mplsOutSegmentTopLabel       = 0, -- outgoing label in label table

    -- RowPointer MUST point to the first accessible column.
    mplsOutSegmentTrafficParamPtr = 0.0,
    mplsOutSegmentLabelPtr        = gmplsLabelTable (12, 1, 0)

    mplsOutSegmentRowStatus       = createAndWait(5)
}
```

These table entries are extended by entries in gmplsInSegmentTable and gmplsOutSegmentTable. Note that the nature of the 'extends' relationship is a sparse augmentation so that the entry in gmplsInSegmentTable has the same index values as the entry in mplsInSegmentTable. Similarly, the entry in gmplsOutSegmentTable has the same index values as the entry in mplsOutSegmentTable.

First for the forward direction:

```
In gmplsInSegmentTable(0x00000015)
{
    gmplsInSegmentDirection      = forward (1)
}
```

```
In gmplsOutSegmentTable(0x00000012)
{
    gmplsOutSegmentDirection     = forward (1)
}
```

Next for the reverse direction:

```
In gmplsInSegmentTable(0x00000016)
{
    gmplsInSegmentDirection      = reverse (2)
}
```

```
In gmplsOutSegmentTable(0x00000013)
{
    gmplsOutSegmentDirection     = reverse (2)
}
```

Next, two cross-connect entries are created in the mplsXCTable of the MPLS-LSR-STD-MIB [[RFC3813](#)], thereby associating the newly created segments together.



In mplsXCTable:

```
{
    mplsXCIndex                = 0x01,
    mplsXCInSegmentIndex       = 0x00000015,
    mplsXCOutSegmentIndex      = 0x00000012,
    mplsXCLspId                = 0x0102 -- unique ID
    mplsXCLabelStackIndex      = 0x00, -- only a single outgoing label
    mplsXCRowStatus            = createAndGo(4)
}
```

In mplsXCTable:

```
{
    mplsXCIndex                = 0x02,
    mplsXCInSegmentIndex       = 0x00000016,
    mplsXCOutSegmentIndex      = 0x00000013,
    mplsXCLspId                = 0x0102 -- unique ID
    mplsXCLabelStackIndex      = 0x00, -- only a single outgoing label
    mplsXCRowStatus            = createAndGo(4)
}
```

Finally, the in-segments and out-segments are activated.

In mplsInSegmentTable(0x00000015):

```
{
    mplsInSegmentRowStatus      = active(1)
}
```

In mplsInSegmentTable(0x00000016):

```
{
    mplsInSegmentRowStatus      = active(1)
}
```

In mplsOutSegmentTable(0x00000012):

```
{
    mplsOutSegmentRowStatus     = active(1)
}
```

In mplsOutSegmentTable(0x00000013):

```
{
    mplsOutSegmentRowStatus     = active(1)
}
```



## 7. GMPLS Label Switching Router MIB Definitions

This MIB module makes references to the following documents.

[[RFC2578](#)], [[RFC2579](#)], [[RFC2580](#)], [[GMPLSTCMIB](#)], [[RFC3811](#)], [[RFC2863](#)] and [[RFC3813](#)].

GMPLS-LSR-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, Unsigned32, zeroDotZero  
FROM SNMPv2-SMI -- [RFC2578](#)  
MODULE-COMPLIANCE, OBJECT-GROUP  
FROM SNMPv2-CONF -- [RFC2580](#)  
RowPointer  
FROM SNMPv2-TC -- [RFC2579](#)  
GmplsSegmentDirectionTC  
FROM GMPLS-TC-STD-MIB -- GMPLSTCMIB

-- RFC-Editor please resolve the reference above to GMPLSTCMIB  
-- using the assigned RFC number and remove this note  
mplsInterfaceIndex, mplsInSegmentIndex, mplsOutSegmentIndex,  
mplsInterfaceGroup, mplsInSegmentGroup, mplsOutSegmentGroup,  
mplsXCGroup, mplsPerfGroup, mplsLsrNotificationGroup  
FROM MPLS-LSR-STD-MIB -- [RFC3813](#)  
ifGeneralInformationGroup, ifCounterDiscontinuityGroup  
FROM IF-MIB -- [RFC2863](#)  
mplsStdMIB  
FROM MPLS-TC-STD-MIB -- [RFC3811](#)  
;

gmplsLsrStdMIB MODULE-IDENTITY

LAST-UPDATED

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ORGANIZATION

"IETF Common Control And Measurement Plane (CCAMP) Working Group"

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Comments about this document should be emailed direct to the  
CCAMP working group mailing list at [ccamp@ops.ietf.org](mailto:ccamp@ops.ietf.org)"

DESCRIPTION

"Copyright (C) The Internet Society (2006). This version of  
this MIB module is part of RFC XXX; see the RFC itself for  
full legal notices.

-- RFC Editor. Please replace XXX above with the correct RFC number and

-- remove this note.

This MIB module contains managed object definitions for the Generalized Multiprotocol (GMPLS) Label Switching Router as defined in: Generalized Multi-Protocol Label Switching (GMPLS) Architecture, Mannie et al., [RFC 3945](#), October 2004."

## REVISION

"200609060001Z" -- 06 September 2006 00:00:01 GMT

## DESCRIPTION

"Initial version issued as part of RFC XXX."

::= { mplStdMIB YYY }

-- RFC Editor. Please replace XXX above with the correct RFC number and  
-- remove this note.

-- RFC Editor. Please replace YYY above with the OID assigned by IANA  
-- and remove this note

-- no notifications are currently defined.

gmplsLsrObjects OBJECT IDENTIFIER ::= { gmplsLsrStdMIB 1 }

gmplsLsrConformance OBJECT IDENTIFIER ::= { gmplsLsrStdMIB 2 }

## gmplsInterfaceTable OBJECT-TYPE

SYNTAX SEQUENCE OF GmplsInterfaceEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"This table specifies per-interface GMPLS capability and associated information. It extends the information in mplsInterfaceTable of the MPLS-LSR-STD-MIB through a sparse augmentation relationship."

## REFERENCE

"1. Multiprotocol Label Switching (MPLS) Label Switching (LSR) Router Management Information Base (MIB), [RFC 3813](#)."

::= { gmplsLsrObjects 1 }

## gmplsInterfaceEntry OBJECT-TYPE

SYNTAX GmplsInterfaceEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"A conceptual row in this table is created automatically by an LSR for each interface that is both capable of supporting GMPLS and that is configured to support GMPLS. Note that support of GMPLS is not limited to control plane signaling, but may include data-plane only function configured through SNMP SET commands performed on this MIB module.

A conceptual row in this table may also be created via SNMP SET commands or automatically by the LSR to supplement a conceptual row in the mplsInterfaceTable where the interface is not capable of GMPLS but where the other objects carried

in this row provide useful additional information for an MPLS interface.

A conceptual row in this table will exist if and only if a corresponding entry in `mplsInterfaceTable` exists, and a corresponding entry in `ifTable` exists with `ifType = mpls(166)`. If the associated entry in `ifTable` is operationally disabled (thus removing the GMPLS capabilities on the interface) or the entry in `mplsInterfaceTable` is deleted, the corresponding entry in this table MUST be deleted shortly thereafter.

The indexes are the same as for `mplsInterfaceTable`. Thus, the entry with index 0 represents the per-platform label space and contains parameters that apply to all interfaces that participate in the per-platform label space."

#### REFERENCE

"1. Multiprotocol Label Switching (MPLS) Label Switching (LSR) Router Management Information Base (MIB), [RFC 3813](#)."

INDEX { `mplsInterfaceIndex` }

::= { `gmplsInterfaceTable` 1 }

```
GmplsInterfaceEntry ::= SEQUENCE {  
    gmplsInterfaceSignalingCaps    BITS,  
    gmplsInterfaceRsvpHelloPeriod  Unsigned32  
}
```

`gmplsInterfaceSignalingCaps` OBJECT-TYPE

```
SYNTAX BITS {  
    unknown (0),  
    rsvpGmpls (1),  
    crldpGmpls (2), -- note the use of CR-LDP is deprecated  
    otherGmpls (3)  
}
```

MAX-ACCESS read-create

STATUS current

#### DESCRIPTION

"Defines the signaling capabilities on this interface. Multiple bits may legitimately be set at once, but if 'unknown' is set then no other bit may be set. Setting no bits implies that GMPLS signaling cannot be performed on this interface and all LSPs must be manually provisioned or that this table entry is only present to supplement an entry in the `mplsInterfaceTable` by providing the information carried in other objects in this row."

#### REFERENCE

"1. Generalized MPLS Signaling - CR-LDP Extensions, [RFC 3472](#)."

2. The Multiprotocol Label Switching (MPLS) Working Group decision on MPLS signaling protocols, [RFC 3468](#)."

3. Generalized MPLS Signaling - RSVP-TE Extensions, [RFC 3473](#)."

DEFVAL { { `rsvpGmpls` } }

```
::= { gmplsInterfaceEntry 1 }
```

**gmplsInterfaceRsvpHelloPeriod OBJECT-TYPE**

SYNTAX           Unsigned32  
UNITS            "milliseconds"  
MAX-ACCESS       read-create  
STATUS           current

**DESCRIPTION**

"Period, in milliseconds, between sending RSVP Hello messages on this interface. A value of 0 indicates that no Hello messages should be sent on this interface.

This object is only valid if gmplsInterfaceSignalingCaps has no bits set or includes the rsvpGmpls bit."

**REFERENCE**

1. RSVP-TE: Extensions to RSVP for LSP Tunnels, [RFC 3209](#), [section 5](#).
2. Generalized MPLS Signaling - RSVP-TE Extensions, [RFC 3473](#), [section 9.3](#)."

DEFVAL { 3000 }

::= { gmplsInterfaceEntry 2 }

**gmplsInSegmentTable OBJECT-TYPE**

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

**DESCRIPTION**

"This table sparse augments the mplsInSegmentTable of the MPLS-LSR-STD-MIB to provide GMPLS-specific information about incoming segments to an LSR."

**REFERENCE**

1. Multiprotocol Label Switching (MPLS) Label Switching (LSR) Router Management Information Base (MIB), [RFC 3813](#)."

::= { gmplsLsrObjects 2 }

**gmplsInSegmentEntry OBJECT-TYPE**

SYNTAX           GmplsInSegmentEntry  
MAX-ACCESS       not-accessible  
STATUS           current

**DESCRIPTION**

"An entry in this table extends the representation of an incoming segment represented by an entry in mplsInSegmentTable in the MPLS-LSR-STD-MIB through a sparse augmentation. An entry can be created by a network administrator via SNMP SET commands, or in response to signaling protocol events.

Note that the storage type for this entry is given by the value of mplsInSegmentStorageType in the corresponding entry of the mplsInSegmentTable."

**REFERENCE**

1. Multiprotocol Label Switching (MPLS) Label Switching (LSR)

Router Management Information Base (MIB), [RFC 3813](#)."

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```
INDEX { mplsInSegmentIndex }  
 ::= { gmplsInSegmentTable 1 }
```

```
GmplsInSegmentEntry ::= SEQUENCE {  
    gmplsInSegmentDirection      GmplsSegmentDirectionTC,  
    gmplsInSegmentExtraParamsPtr RowPointer  
}
```

gmplsInSegmentDirection OBJECT-TYPE

SYNTAX GmplsSegmentDirectionTC

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object indicates the direction of data flow on this segment. This object cannot be modified if mplsInSegmentRowStatus for the corresponding entry in the mplsInSegmentTable is active(1)."

REFERENCE

"1. Multiprotocol Label Switching (MPLS) Label Switching (LSR) Router Management Information Base (MIB), [RFC 3813](#)."

DEFVAL { forward }

```
 ::= { gmplsInSegmentEntry 1 }
```

gmplsInSegmentExtraParamsPtr OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Some Tunnels will run over transports that can usefully support technology-specific additional parameters (for example, SONET resource usage). Such can be supplied from an external table and referenced from here. A value of zeroDotzero in this attribute indicates that there is no such additional information."

DEFVAL { zeroDotZero }

```
 ::= { gmplsInSegmentEntry 2 }
```

gmplsOutSegmentTable OBJECT-TYPE

SYNTAX SEQUENCE OF GmplsOutSegmentEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table sparse augments the mplsOutSegmentTable of the MPLS-LSR-STD-MIB to provide GMPLS-specific information about outgoing segments from an LSR."

REFERENCE

"1. Multiprotocol Label Switching (MPLS) Label Switching (LSR) Router Management Information Base (MIB), [RFC 3813](#)."

```
 ::= { gmplsLsrObjects 3 }
```



**gmplsOutSegmentEntry OBJECT-TYPE**

SYNTAX GmplsOutSegmentEntry

MAX-ACCESS not-accessible

STATUS current

**DESCRIPTION**

"An entry in this table extends the representation of an outgoing segment represented by an entry in mplsOutSegmentTable of the MPLS-LSR-STD-MIB through a sparse augmentation. An entry can be created by a network administrator via SNMP SET commands, or in response to signaling protocol events.

Note that the storage type for this entry is given by the value of mplsOutSegmentStorageType in the corresponding entry of the mplsOutSegmentTable."

**REFERENCE**

"1. Multiprotocol Label Switching (MPLS) Label Switching (LSR) Router Management Information Base (MIB), [RFC 3813](#)."

INDEX { mplsOutSegmentIndex }

::= { gmplsOutSegmentTable 1 }

GmplsOutSegmentEntry ::= SEQUENCE {

gmplsOutSegmentDirection GmplsSegmentDirectionTC,

gmplsOutSegmentTTLDecrement Unsigned32,

gmplsOutSegmentExtraParamsPtr RowPointer

}

**gmplsOutSegmentDirection OBJECT-TYPE**

SYNTAX GmplsSegmentDirectionTC

MAX-ACCESS read-create

STATUS current

**DESCRIPTION**

"This object indicates the direction of data flow on this segment. This object cannot be modified if mplsOutSegmentRowStatus for the corresponding entry in the mplsOutSegmentTable is active(1)."

**REFERENCE**

"1. Multiprotocol Label Switching (MPLS) Label Switching (LSR) Router Management Information Base (MIB), [RFC 3813](#)."

DEFVAL { forward }

::= { gmplsOutSegmentEntry 1 }

**gmplsOutSegmentTTLDecrement OBJECT-TYPE**

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

**DESCRIPTION**

"This object indicates the amount by which to decrement the TTL of any payload packets forwarded on this segment if per-hop decrementing is being done.



A value of zero indicates that no decrement should be made or that per-hop decrementing is not in use.

See the `gmplsTunnelTTLDecrement` object in the `gmplsTunnelTable` of GMPLS-TE-STD-MIB for a value by which to decrement the TTL for the whole of a tunnel.

This object cannot be modified if `mplsOutSegmentRowStatus` for the associated entry in the `mplsOutSegmentTable` is `active(1)`."

#### REFERENCE

- "1. Time To Live (TTL) Processing in Multi-Protocol Label Switching (MPLS) Networks, [RFC 3443](#)."
- "2. Generalized Multiprotocol Label Switching (GMPLS) Traffic Engineering Management Information Base, RFC XXX."

-- RFC Editor. Please insert the correct RFC number and remove this note

DEFVAL { 0 }

::= { gmplsOutSegmentEntry 2 }

`gmplsOutSegmentExtraParamsPtr` OBJECT-TYPE

SYNTAX RowPointer

MAX-ACCESS read-create

STATUS current

#### DESCRIPTION

"Some Tunnels will run over transports that can usefully support technology-specific additional parameters (for example, SONET resource usage). Such can be supplied from an external table and referenced from here.

A value of `zeroDotzero` in this attribute indicates that there is no such additional information."

DEFVAL { zeroDotZero }

::= { gmplsOutSegmentEntry 3 }

`gmplsLsrGroups`

OBJECT IDENTIFIER ::= { gmplsLsrConformance 1 }

`gmplsLsrCompliances`

OBJECT IDENTIFIER ::= { gmplsLsrConformance 2 }

-- Compliance requirement for fully compliant implementations.

`gmplsLsrModuleFullCompliance` MODULE-COMPLIANCE

STATUS current

#### DESCRIPTION

"Compliance statement for agents that provide full support for GMPLS-LSR-STD-MIB.

The mandatory group has to be implemented by all LSRs that originate, terminate or act as transit for TE-LSPs/tunnels. In addition, depending on the type of tunnels supported, other



groups become mandatory as explained below."

MODULE IF-MIB -- The Interfaces Group MIB, [RFC 2863](#).

```
MANDATORY-GROUPS {  
    ifGeneralInformationGroup,  
    ifCounterDiscontinuityGroup  
}
```

MODULE MPLS-LSR-STD-MIB -- The MPLS-LSR-STD-MIB, [RFC3813](#)

```
MANDATORY-GROUPS {  
    mplsInterfaceGroup,  
    mplsInSegmentGroup,  
    mplsOutSegmentGroup,  
    mplsXCGroup,  
    mplsPerfGroup,  
    mplsLsrNotificationGroup  
}
```

MODULE -- this module

```
MANDATORY-GROUPS {  
    gmplsInterfaceGroup,  
    gmplsInSegmentGroup,  
    gmplsOutSegmentGroup  
}
```

```
OBJECT      gmplsInSegmentDirection  
SYNTAX      GmplsSegmentDirectionTC  
MIN-ACCESS  read-only  
DESCRIPTION  
    "The only valid value for unidirectional LSPs is forward(1)."
```

```
OBJECT      gmplsOutSegmentDirection  
SYNTAX      GmplsSegmentDirectionTC  
MIN-ACCESS  read-only  
DESCRIPTION  
    "The only valid value for unidirectional LSPs is forward(1)."
```

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

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



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

::= { gmplsLsrCompliances 1 }

-- Compliance requirement for implementations that provide read-only
-- access.

gmplsLsrModuleReadOnlyCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
    "Compliance requirement for implementations that only provide
    read-only support for GMPLS-LSR-STD-MIB. Such devices can then
    be monitored but cannot be configured using this MIB module."

MODULE IF-MIB -- The interfaces Group MIB, RFC 2863

MANDATORY-GROUPS {
    ifGeneralInformationGroup,
    ifCounterDiscontinuityGroup
}

MODULE MPLS-LSR-STD-MIB

MANDATORY-GROUPS {
    mplsInterfaceGroup,
    mplsInSegmentGroup,
    mplsOutSegmentGroup,
    mplsXCGroup,
    mplsPerfGroup
}

MODULE -- this module

MANDATORY-GROUPS {
    gmplsInterfaceGroup,
    gmplsInSegmentGroup,
    gmplsOutSegmentGroup
}

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



OBJECT        gmplsInterfaceRsvpHelloPeriod

MIN-ACCESS   read-only

DESCRIPTION

"Write access is not required."

OBJECT        gmplsInSegmentDirection

SYNTAX        GmplsSegmentDirectionTC

MIN-ACCESS   read-only

DESCRIPTION

"The only valid value for unidirectional LSPs is forward(1)."

OBJECT        gmplsInSegmentExtraParamsPtr

MIN-ACCESS   read-only

DESCRIPTION

"Write access is not required."

OBJECT        gmplsOutSegmentDirection

MIN-ACCESS   read-only

DESCRIPTION

"The only valid value for unidirectional LSPs is forward(1)."

OBJECT        gmplsOutSegmentTTLDcrement

MIN-ACCESS   read-only

DESCRIPTION

"Write access is not required."

OBJECT        gmplsOutSegmentExtraParamsPtr

MIN-ACCESS   read-only

DESCRIPTION

"Write access is not required."

::= { gmplsLsrCompliances 2 }

gmplsInterfaceGroup OBJECT-GROUP

OBJECTS {

    gmplsInterfaceSignalingCaps,

    gmplsInterfaceRsvpHelloPeriod

}

STATUS    current

DESCRIPTION

"Collection of objects which provide additional  
information for an MPLS interface and are needed  
for GMPLS interface configuration and performance  
information."

::= { gmplsLsrGroups 1 }



```
gmplsInSegmentGroup  OBJECT-GROUP
  OBJECTS {
    gmplsInSegmentDirection,
    gmplsInSegmentExtraParamsPtr
  }
  STATUS  current
  DESCRIPTION
    "Collection of objects which provide additional
    information for an MPLS in-segment and are needed
    for GMPLS in-segment configuration and performance
    information."
 ::= { gmplsLsrGroups 2 }

gmplsOutSegmentGroup  OBJECT-GROUP
  OBJECTS {
    gmplsOutSegmentDirection,
    gmplsOutSegmentTTLDcrement,
    gmplsOutSegmentExtraParamsPtr
  }
  STATUS  current
  DESCRIPTION
    "Collection of objects which provide additional
    information for an MPLS out-segment and are needed
    for GMPLS out-segment configuration and performance
    information."
 ::= { gmplsLsrGroups 3 }
END
```



## 8. GMPLS Label MIB Definitions

This MIB module makes references to the following documents.

[[RFC2578](#)], [[RFC2579](#)], [[RFC2580](#)], [[GMPLSTCMIB](#)], [[RFC3811](#)],  
[[RFC2863](#)], [[RFC3289](#)], [[RFC3813](#)], and [[RFC3471](#)].

GMPLS-LABEL-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, Unsigned32, Integer32  
FROM SNMPv2-SMI -- [RFC2578](#)  
MODULE-COMPLIANCE, OBJECT-GROUP  
FROM SNMPv2-CONF -- [RFC2580](#)  
RowStatus, StorageType  
FROM SNMPv2-TC -- [RFC2579](#)  
InterfaceIndexOrZero  
FROM IF-MIB -- [RFC2863](#)  
IndexIntegerNextFree  
FROM DIFFSERV-MIB -- [RFC3289](#)  
MplsLabel, mplsStdMIB  
FROM MPLS-TC-STD-MIB -- [RFC3811](#)  
GmplsLabelTypeTC, GmplsFreeformLabelTC  
FROM GMPLS-TC-STD-MIB -- GMPLSTCMIB

-- RFC-Editor. Please resolve the reference above to GMPLSTCMIB  
-- to use the assigned RFC number and remove this note  
;

gmplsLabelStdMIB MODULE-IDENTITY

LAST-UPDATED

"200609060001Z" -- 06 September 2006 00:00:01 GMT

ORGANIZATION

"IETF Common Control And Measurement Plane (CCAMP) Working Group"

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Comments about this document should be emailed direct to the  
CCAMP working group mailing list at [ccamp@ops.ietf.org](mailto:ccamp@ops.ietf.org)

DESCRIPTION

"Copyright (C) The Internet Society (2006). This version of  
this MIB module is part of RFC XXX; see the RFC itself for  
full legal notices.

-- RFC Editor. Please replace XXX above with the correct RFC number and

-- remove this note.

Nadeau and Farrel

Expires March 2007

[Page 22]

This MIB module contains managed object definitions for labels within GMPLS systems as defined in:

Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description, Berger, L. (Editor), [RFC 3471](#), January 2003."

## REVISION

"200609060001Z" -- 06 September 2006 00:00:01 GMT

## DESCRIPTION

"Initial version issued as part of RFC XXX."

::= { mplStdMIB ZZZ }

-- RFC Editor. Please replace XXX above with the correct RFC number and

-- remove this note.

-- RFC Editor. Please replace ZZZ above with the OID assigned by IANA

-- and remove this note

-- no notifications are currently defined.

gmplsLabelObjects OBJECT IDENTIFIER ::= { gmplsLabelStdMIB 1 }

gmplsLabelConformance OBJECT IDENTIFIER ::= { gmplsLabelStdMIB 2 }

gmplsLabelIndexNext OBJECT-TYPE

SYNTAX IndexIntegerNextFree

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"This object contains an unused value for gmplsLabelIndex, or a zero to indicate that no unused value exists or is available.

A management application wishing to create a row in the gmplsLabelTable may read this object and then attempt to create a row in the table. If row creation fails (because another application has already created a row with the supplied index) the management application should read this object again to get a new index value.

When a row is created in the gmplsLabelTable with the gmplsLabelIndex value held by this object, an implementation MUST change the value in this object."

::= { gmplsLabelObjects 1 }

gmplsLabelTable OBJECT-TYPE

SYNTAX SEQUENCE OF GmplsLabelEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"Table of GMPLS Labels. This table allows the representation of the more complex label forms required for GMPLS which cannot

be held within the textual convention MplsLabel. That is labels

that cannot be encoded within 32 bits. It is, nevertheless also capable of holding 32 bit labels or regular MPLS labels if desired.

Each entry in this table represents an individual GMPLS label value. Labels in the tables in other MIB modules may be referred to using a row pointer into this table. The indexing of this table provides for arbitrary indexing and also for concatenation of labels.

For an example of label concatenation see [RFC3945 section 7.1](#). In essence, a GMPLS label may be composite in order to identify a set of resources in the data plane. Practical examples are timeslots and wavelength sets (which are not contiguous like wavebands).

The indexing mechanism allows multiple entries in this table to be seen as a sequence of labels that should be concatenated. Ordering is potentially very sensitive for concatenation."

#### REFERENCE

"1. Generalized Multiprotocol Label Switching (GMPLS) Architecture, [RFC 3945, section 7.1](#),"

::= { gmplsLabelObjects 2 }

gmplsLabelEntry OBJECT-TYPE

SYNTAX GmplsLabelEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"An entry in this table represents a single label value. There are three indexes into the table.

- The interface index may be helpful to distinguish which labels are in use on which interfaces or to handle cases where there are a very large number of labels in use in the system. When label representation is desired to apply to the whole system or when it is not important to distinguish labels by their interfaces, this index MAY be set to zero.
- The label index provides a way of identifying the label.
- The label sub-index is only used for concatenated labels. It identifies each component label. When non-concatenated labels are used, this index SHOULD be set to zero.

A storage type object is supplied to control the storage type for each entry, but implementations should note that the storage type of conceptual rows in other tables that include row pointers to an entry in this table SHOULD dictate the storage type of the rows in this table where the row in the other table is more persistent."



```
INDEX {
    gmplsLabelInterface,
    gmplsLabelIndex,
    gmplsLabelSubindex }
 ::= { gmplsLabelTable 1 }
```

```
GmplsLabelEntry ::= SEQUENCE {
    gmplsLabelInterface      InterfaceIndexOrZero,
    gmplsLabelIndex          Unsigned32,
    gmplsLabelSubindex       Unsigned32,
    gmplsLabelType           GmplsLabelTypeTC,
    gmplsLabelMplsLabel      MplsLabel,
    gmplsLabelPortWavelength Unsigned32,
    gmplsLabelFreeform       GmplsFreeformLabelTC,
    gmplsLabelSonetSdhSignalIndex Integer32,
    gmplsLabelSdhVc          Integer32,
    gmplsLabelSdhVcBranch    Integer32,
    gmplsLabelSonetSdhBranch Integer32,
    gmplsLabelSonetSdhGroupBranch Integer32,
    gmplsLabelWavebandId     Unsigned32,
    gmplsLabelWavebandStart  Unsigned32,
    gmplsLabelWavebandEnd    Unsigned32,
    gmplsLabelStorageType    StorageType,
    gmplsLabelRowStatus      RowStatus
}
```

```
gmplsLabelInterface OBJECT-TYPE
    SYNTAX      InterfaceIndexOrZero
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The interface on which this label is used. If this object is set
         to zero, the label MUST have applicability across the
         whole system and is not limited to a single interface."
 ::= { gmplsLabelEntry 1 }
```

```
gmplsLabelIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (0..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "An arbitrary index into the table to identify a label.
```

Note that implementations that are representing 32 bit labels within this table MAY choose to align this index with the value of the label and this may result in the use of the value zero since it represents a valid label value. Such implementation should be aware of the implications of sparsely populated tables.



A management application may read the gmplsLabelIndexNext object to find a suitable value for this object."

```
::= { gmplsLabelEntry 2 }
```

gmplsLabelSubindex OBJECT-TYPE

|            |                            |
|------------|----------------------------|
| SYNTAX     | Unsigned32 (0..4294967295) |
| MAX-ACCESS | not-accessible             |
| STATUS     | current                    |

DESCRIPTION

"In conjunction with gmplsLabelInterface and gmplsLabelIndex, this object uniquely identifies this row. This sub-index allows a single GMPLS label to be defined as a concatenation of labels. This is particularly useful in TDM.

The ordering of sub-labels is strict with the sub-label with lowest gmplsLabelSubindex appearing first. Note that all sub-labels of a single GMPLS label must share the same gmplsLabelInterface and gmplsLabelIndex values. For labels that are not composed of concatenated sub-labels, this value SHOULD be set to zero."

```
::= { gmplsLabelEntry 3 }
```

gmplsLabelType OBJECT-TYPE

|            |                  |
|------------|------------------|
| SYNTAX     | GmplsLabelTypeTC |
| MAX-ACCESS | read-create      |
| STATUS     | current          |

DESCRIPTION

"Identifies the type of this label. Note that this object does not determine whether MPLS or GMPLS signaling is in use: a value of gmplsMplsLabel (1) denotes that an MPLS packet label is present in the gmplsLabelMplsLabel object and encoded using the MplsLabel textual convention (may be a 20-bit MPLS label, a 10- or 23-bit Frame Relay label, or an ATM label), but does not describe whether this is signaled using MPLS or GMPLS.

The value of this object helps determine which of the following objects are valid. This object cannot be modified if gmplsLabelRowStatus is active(1)."

REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description, [RFC 3471, section 3](#)."

```
::= { gmplsLabelEntry 4 }
```

gmplsLabelMplsLabel OBJECT-TYPE

|            |             |
|------------|-------------|
| SYNTAX     | MplsLabel   |
| MAX-ACCESS | read-create |
| STATUS     | current     |

DESCRIPTION

"The value of an MPLS label (that is a packet label) if this

table is used to store it. This may be used in MPLS systems even

though the label values can be adequately stored in the MPLS MIB modules (MPLS-LSR-STD-MIB and MPLS-TE-STD-MIB). Further, in mixed MPLS and GMPLS systems it may be advantageous to store all labels in a single label table. Lastly, in GMPLS systems where packet labels are used (that is in systems that use GMPLS signaling and GMPLS labels for packet switching) it may be desirable to use this table.

This object is only valid if gmplsLabelType is set to gmplsMplsLabel (1). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. MPLS Label Stack Encoding, [RFC 3032](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 5 }

## gmplsLabelPortWavelength OBJECT-TYPE

SYNTAX            Unsigned32  
MAX-ACCESS       read-create  
STATUS            current

## DESCRIPTION

"The value of a Port or Wavelength Label when carried as a Generalized Label. Only valid if gmplsLabelType is set to gmplsPortWavelengthLabel(2). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description, [RFC 3471, section 3.2.1.1](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 6 }

## gmplsLabelFreeform OBJECT-TYPE

SYNTAX            GmplsFreeformLabelTC  
MAX-ACCESS       read-create  
STATUS            current

## DESCRIPTION

"The value of a freeform Generalized Label that does not conform to one of the standardized label encoding or that an implementation chooses to represent as an octet string without further decoding. Only valid if gmplsLabelType is set to gmplsFreeformLabel(3). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description, [RFC 3471, section 3.2](#)."

DEFVAL { '00'h }

::= { gmplsLabelEntry 7 }



## gmplsLabelSonetSdhSignalIndex OBJECT-TYPE

SYNTAX Integer32 (0..4095)

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"The Signal Index value (S) of a SONET or SDH Generalized Label. Zero indicates that this field is not significant. Only valid if gmplsLabelType is set to gmplsSonetLabel(4) or gmplsSdhLabel(5). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Extensions for Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Control, [RFC 3946, section 3](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 8 }

## gmplsLabelSdhVc OBJECT-TYPE

SYNTAX Integer32 (0..15)

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"The VC Indicator (U) of an SDH Generalized Label. Zero indicates that this field is non-significant. Only valid if gmplsLabelType is set to gmplsSdhLabel(5). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Extensions for Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Control, [RFC 3946, section 3](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 9 }

## gmplsLabelSdhVcBranch OBJECT-TYPE

SYNTAX Integer32 (0..15)

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"The VC Branch Indicator (K) of an SDH Generalized Label. Zero indicates that this field is non-significant. Only valid if gmplsLabelType is set to gmplsSdhLabel(5). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Extensions for Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Control, [RFC 3946, section 3](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 10 }



## gmplsLabelSonetSdhBranch OBJECT-TYPE

SYNTAX Integer32 (0..15)

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"The Branch Indicator (L) of a SONET or SDH Generalized Label. Zero indicates that this field is non-significant. Only valid gmplsLabelType is set to gmplsSonetLabel(4) or gmplsSdhLabel(5). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Extensions for Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Control, [RFC 3946, section 3](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 11 }

## gmplsLabelSonetSdhGroupBranch OBJECT-TYPE

SYNTAX Integer32 (0..15)

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"The Group Branch Indicator (M) of a SONET or SDH Generalized Label. Zero indicates that this field is non-significant. Only valid if gmplsLabelType is set to gmplsSonetLabel(4) or gmplsSdhLabel(5). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Extensions for Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Control, [RFC 3946, section 3](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 12 }

## gmplsLabelWavebandId OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"The waveband identifier component of a waveband label. Only valid if gmplsLabelType is set to gmplsWavebandLabel(6). This object cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description, [RFC 3471, section 3.3](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 13 }



## gmplsLabelWavebandStart OBJECT-TYPE

SYNTAX           Unsigned32  
MAX-ACCESS       read-create  
STATUS           current

## DESCRIPTION

"The starting label component of a waveband label.  
Only valid if gmplsLabelType is set to gmplsWavebandLabel(6).  
This object cannot be modified if  
gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Signaling  
Functional Description, [RFC 3471, section 3.3](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 14 }

## gmplsLabelWavebandEnd OBJECT-TYPE

SYNTAX           Unsigned32  
MAX-ACCESS       read-create  
STATUS           current

## DESCRIPTION

"The end label component of a waveband label. Only valid if  
gmplsLabelType is set to gmplsWavebandLabel(6). This object  
cannot be modified if gmplsLabelRowStatus is active(1)."

## REFERENCE

"1. Generalized Multi-Protocol Label Switching (GMPLS) Signaling  
Functional Description, [RFC 3471, section 3.3](#)."

DEFVAL { 0 }

::= { gmplsLabelEntry 15 }

## gmplsLabelStorageType OBJECT-TYPE

SYNTAX           StorageType  
MAX-ACCESS       read-create  
STATUS           current

## DESCRIPTION

"This variable indicates the storage type for this object. The  
agent MUST ensure that this object's value remains consistent  
with the storage type of any rows in other tables that contain  
pointers to this row. In particular, the storage type of this  
row must be at least as permanent as that of any row that point  
to it.

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

## REFERENCE

"1. Textual Conventions for SMIV2, STD 58, [RFC 2579, section 2](#)."

DEFVAL { volatile }

::= { gmplsLabelEntry 16 }



## gmplsLabelRowStatus 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 has a row in the active(1) state, no objects in this row can be modified except the gmplsLabelRowStatus and gmplsLabelStorageType.

The gmplsLabelType object does not have a default and must be set before a row can become active. The corresponding label objects (dependent on the value of gmplsLabelType) should also be set unless they happen to need to use the specified default values as follows:

| gmplsLabelType setting      | objects to be set                                                                                                                      |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| -----                       | -----                                                                                                                                  |
| gmplsMplsLabel(1)           | gmplsLabelMplsLabel                                                                                                                    |
| gmplsPortWavelengthLabel(2) | gmplsLabelPortWavelength                                                                                                               |
| gmplsFreeformLabel(3)       | gmplsLabelFreeform                                                                                                                     |
| gmplsSonetLabel(4)          | gmplsLabelSonetSdhSignalIndex<br>gmplsLabelSdhVc<br>gmplsLabelSdhVcBranch<br>gmplsLabelSonetSdhBranch<br>gmplsLabelSonetSdhGroupBranch |
| gmplsSdhLabel(5)            | gmplsLabelSonetSdhSignalIndex<br>gmplsLabelSdhVc<br>gmplsLabelSdhVcBranch<br>gmplsLabelSonetSdhBranch<br>gmplsLabelSonetSdhGroupBranch |
| gmplsWavebandLabel(6)       | gmplsLabelWavebandId<br>gmplsLabelWavebandStart<br>gmplsLabelWavebandEnd"                                                              |

::= { gmplsLabelEntry 17 }

## gmplsLabelGroups

OBJECT IDENTIFIER ::= { gmplsLabelConformance 1 }

## gmplsLabelCompliances

OBJECT IDENTIFIER ::= { gmplsLabelConformance 2 }



## gmplsLabelModuleReadOnlyCompliance MODULE-COMPLIANCE

STATUS current

## DESCRIPTION

"Compliance requirement for implementations that only provide read-only support for GMPLS-LABEL-STD-MIB. Such devices can then be monitored but cannot be configured using this MIB module."

MODULE -- this module

-- The mandatory groups have to be implemented by LSRs claiming  
-- support for this MIB module. This MIB module is, however, not  
-- mandatory for a working implementation of a GMPLS LSR with full  
-- MIB support if the GMPLS labels in use can be represented within  
-- a 32 bit quantity.

MANDATORY-GROUPS {  
 gmplsLabelTableGroup  
}

## GROUP gmplsLabelPacketGroup

## DESCRIPTION

"This group extends gmplsLabelTableGroup for implementations that support packet labels. It is optional for implementations that do not support packet labels."

## GROUP gmplsLabelPortWavelengthGroup

## DESCRIPTION

"This group extends gmplsLabelTableGroup for implementations that support port and wavelength labels. It is optional for implementations that do not support wavelength labels."

## GROUP gmplsLabelFreeformGroup

## DESCRIPTION

"This group extends gmplsLabelTableGroup for implementations that support freeform labels. It is optional for implementations that do not support freeform labels."

## GROUP gmplsLabelSonetSdhGroup

## DESCRIPTION

"This group extends gmplsLabelTableGroup for implementations that support SONET or SDH labels. It is optional for implementations that do not support SONET or SDH labels."

## GROUP gmplsLabelWavebandGroup

## DESCRIPTION

"This group extends gmplsLabelTableGroup for implementations that support Waveband labels. It is optional for implementations that do not support Waveband labels."



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

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

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

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

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

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

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

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

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

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



OBJECT        gmplsLabelWavebandStart  
MIN-ACCESS   read-only  
DESCRIPTION

"Write access is not required."

OBJECT        gmplsLabelWavebandEnd  
MIN-ACCESS   read-only  
DESCRIPTION

"Write access is not required."

OBJECT        gmplsLabelStorageType  
MIN-ACCESS   read-only  
DESCRIPTION

"Write access is not required."

OBJECT        gmplsLabelRowStatus  
SYNTAX        RowStatus { active(1) }  
MIN-ACCESS   read-only  
DESCRIPTION

"Write access is not required, and active(1) is  
the only status that needs to be supported."

::= { gmplsLabelCompliances 1 }

gmplsLabelModuleFullCompliance MODULE-COMPLIANCE  
STATUS current  
DESCRIPTION

"Compliance statement for agents that support the complete  
GMPLS-LABEL-STD-MIB module.

The mandatory groups have to be implemented by GMPLS LSRs  
claiming support for this MIB module. This MIB module is,  
however, not mandatory for a working implementation of a GMPLS  
LSR with full MIB support if the GMPLS labels in use can be  
represented within a 32 bit quantity."

MODULE -- this module

MANDATORY-GROUPS {  
    gmplsLabelTableGroup  
}

::= { gmplsLabelCompliances 2 }



## gmplsLabelTableGroup OBJECT-GROUP

```
OBJECTS {
    gmplsLabelIndexNext,
    gmplsLabelType,
    gmplsLabelStorageType,
    gmplsLabelRowStatus
}
```

STATUS current

## DESCRIPTION

"Necessary, but not sufficient, set of objects to implement label table support. In addition, depending on the type of labels supported, the following other groups defined below are mandatory:

gmplsLabelWavebandGroup and/or  
gmplsLabelPacketGroup and/or  
gmplsLabelPortWavelengthGroup and/or  
gmplsLabelFreeformGroup and/or  
gmplsLabelSonetSdhGroup."

::= { gmplsLabelGroups 1 }

## gmplsLabelPacketGroup OBJECT-GROUP

```
OBJECTS {
    gmplsLabelMplsLabel
}
```

STATUS current

## DESCRIPTION

"Object needed to implement Packet (MPLS) labels."

::= { gmplsLabelGroups 2 }

## gmplsLabelPortWavelengthGroup OBJECT-GROUP

```
OBJECTS {
    gmplsLabelPortWavelength
}
```

STATUS current

## DESCRIPTION

"Object needed to implement Port and Wavelength labels."

::= { gmplsLabelGroups 3 }

## gmplsLabelFreeformGroup OBJECT-GROUP

```
OBJECTS {
    gmplsLabelFreeform
}
```

STATUS current

## DESCRIPTION

"Object needed to implement Freeform labels."

::= { gmplsLabelGroups 4 }



```
gmplsLabelSonetSdhGroup OBJECT-GROUP
  OBJECTS {
    gmplsLabelSonetSdhSignalIndex,
    gmplsLabelSdhVc,
    gmplsLabelSdhVcBranch,
    gmplsLabelSonetSdhBranch,
    gmplsLabelSonetSdhGroupBranch
  }
  STATUS current
  DESCRIPTION
    "Object needed to implement SONET and SDH labels."
  ::= { gmplsLabelGroups 5 }

gmplsLabelWavebandGroup OBJECT-GROUP
  OBJECTS {
    gmplsLabelWavebandId,
    gmplsLabelWavebandStart,
    gmplsLabelWavebandEnd
  }
  STATUS current
  DESCRIPTION
    "Object needed to implement Waveband labels."
  ::= { gmplsLabelGroups 6 }

END
```

## 9. Security Considerations

It is clear that the MIB modules described in this document in association with the MPLS-LSR-STD-MIB [[RFC3813](#)] are potentially useful for monitoring of GMPLS LSRs. These MIB modules 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 these MIB modules 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 gmplsInterfaceTable, gmplsInSegmentTable, gmplsOutSegmentTable and gmplsLabelTable collectively contain objects to provision GMPLS interfaces, LSPs and their associated parameters on a Label Switching Router (LSR). Unauthorized write access to objects in these tables, could result in disruption of traffic on the network. This is especially true if an LSP has already been

established.

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Some of the readable objects in these MIB modules (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

- o the gmplsInterfaceTable, gmplsInSegmentTable, gmplsOutSegmentTable and gmplsLabelTable collectively show the LSP network topology and its capabilities. If an Administrator does not want to reveal this information, then these tables should be considered sensitive/vulnerable.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), 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 these MIB modules.

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.

## **[10. Acknowledgments](#)**

This document is a product of the CCAMP Working Group.

This document extends the MIB tables in [\[RFC3813\]](#). The authors would like to express their gratitude to all those who worked on that earlier MIB document.

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Joan Cucchiara provided a helpful and very thorough MIB Doctor review.



## 11. IANA Considerations

IANA is requested to root MIB objects in the two MIB modules contained in this document under the mplsStdMIB subtree.

Upon approval of this document, the IANA will make the following assignments in the "NETWORK MANAGEMENT PARAMETERS" registry located at <http://www.iana.org/assignments/smi-numbers> in table:

...mib-2.transmission.mplsStdMIB (1.3.6.1.2.1.10.166)

| Decimal | Name                | References                |
|---------|---------------------|---------------------------|
| -----   | -----               | -----                     |
| TBD+2   | GMPLS-LSR-STD-MIB   | [RFC-ccamp-gmpls-lsr-mib] |
| TBD+3   | GMPLS-LABEL-STD-MIB | [RFC-ccamp-gmpls-lsr-mib] |

-- RFC Editor. Please replace YYY in the main text with the OID assigned  
-- by IANA for GMPLS-LSR-STD-MIB and remove this note.

-- RFC Editor. Please replace ZZZ in the main text with the OID assigned  
-- by IANA for GMPLS-LABEL-STD-MIB and remove this note.

In the future, GMPLS related standards track MIB modules should be rooted under the mplsStdMIB (sic) subtree. IANA has been requested to manage that namespace in the SMI Numbers registry [[RFC3811](#)]. New assignments can only be made via a Standards Action as specified in [[RFC2434](#)].

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