

Internet Engineering Task Force
Internet-Draft
Intended status: Standards Track
Expires: August 12, 2014

G.Galimberti, Ed.
Cisco
R.Kunze, Ed.
Deutsche Telekom
Kam Lam, Ed.
Alcatel-Lucent
D. Hiremagalur, Ed.
Juniper
February 8, 2014

An SNMP MIB extension to RFC3591 to manage optical interface parameters
of DWDM applications
draft-galikunze-ccamp-g-698-2-snmp-mib-06

Abstract

This memo defines a module of the Management Information Base (MIB) used by Simple Network Management Protocol (SNMP) in TCP/IP- based internet. In particular, it defines objects for managing Optical parameters associated with Dense Wavelength Division Multiplexing (DWDM) interfaces. This is an extension of the RFC3591 to support the optical parameters described in ITU-T G.698.2. [ITU.G698.2]

The MIB module defined in this memo can be used for Optical Parameters monitoring and/or configuration of the endpoints of Black Links.

Copyright Notice

Copyright (c) 2012 IETF Trust and the persons identified as the document authors. All rights reserved.

Status of This Memo

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

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

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

This Internet-Draft will expire on August 12, 2014.

Copyright Notice

Copyright (c) 2014 IETF Trust and the persons identified as the document authors. All rights reserved.

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

Table of Contents

1. Introduction	3
2. The Internet-Standard Management Framework	4
3. Conventions	4
4. Overview	4
4.1. Optical Parameters Description	5
4.1.1. Rs-Ss Configuration	6
4.1.2. Table of Application Codes	7
4.1.3. Table of Vendor Application Codes	7
4.2. Use of ifTable	8
4.2.1. Use of ifTable for OPS Layer	10
4.2.2. Use of ifTable for OCh Layer	11
4.2.3. Use of ifStackTable	11
5. Structure of the MIB Module	12
6. Object Definitions	12
7. Relationship to Other MIB Modules	19
7.1. Relationship to the [TEMPLATE TODO] MIB	19
7.2. MIB modules required for IMPORTS	19
8. Definitions	19
9. Security Considerations	19
10. IANA Considerations	20
11. Contributors	21
12. References	22
12.1. Normative References	23
12.2. Informative References	25
Appendix A. Change Log	25
Appendix B. Open Issues	25
Authors' Addresses	25

1. Introduction

This memo defines a portion of the Management Information Base (MIB) used by Simple Network Management Protocol (SNMP) in TCP/IP- based internets. In particular, it defines objects for managing Optical parameters associated with Wavelength Division Multiplexing (WDM) systems in accordance with the optical interface defined in G.698.2 [ITU.G698.2]

Black Link approach allows supporting an optical transmitter/receiver pair of one vendor to inject a DWDM channel and run it over an optical network composed of amplifiers, filters, add-drop multiplexers from a different vendor. From architectural point of view, the "Black Link" is a set of pre-configured/qualified network connections between the G.698.2 reference points S and R. The black links will be managed at the edges (i.e. the transmitters and receivers attached to the S and R reference points respectively) for the relevant parameters specified in G.698.2 [ITU.G698.2], G.798 [ITU.G798], G.874 [ITU.G874], and the performance parameters specified G.7710/Y.1701 [ITU-T G.7710] and and G.874.1 [ITU.G874.1].

The G.698.2 [ITU.G698.2] provides optical parameter values for physical layer interfaces of Dense Wavelength Division Multiplexing (DWDM) systems primarily intended for metro applications which include optical amplifiers. Applications are defined in G.698.2 [ITU.G698.2] using optical interface parameters at the single-channel connection points between optical transmitters and the optical multiplexer, as well as between optical receivers and the optical demultiplexer in the DWDM system. This Recommendation uses a methodology which does not specify the details of the optical link, e.g. the maximum fibre length, explicitly. The Recommendation currently includes unidirectional DWDM applications at 2.5 and 10 Gbit/s (with 100 GHz and 50 GHz channel frequency spacing). Work is still under way for 40 and 100 Gbit/s interfaces. There is possibility for extensions to a lower channel frequency spacing. This document specifically refers to the "application code" defined in the G.698.2 [ITU.G698.2] plus few optical parameter not included in the application code definition.

This draft refers and supports also the draft-kunze-g-698-2-management-control-framework

The building of an SNMP MIB describing the optical parameters defined in G.698.2 [ITU.G698.2] G.798 [ITU.G798], G.874 [ITU.G874], parameters specified G.7710/Y.1701 [ITU-T G.7710] allows the different vendors and operator to retrieve, provision and exchange information related to Optical black links in a standardized way.

This facilitates interworking in case of using optical interfaces from different vendors at the end of the link.

The MIB, reporting the Optical parameters and their values, characterizes the features and the performances of the optical components and allow a reliable black link design in case of multi vendor optical networks.

Although RFC 3591 [RFC3591] describes and defines the SNMP MIB of a number of key optical parameters, alarms and Performance Monitoring, a more complete description of optical parameters and processes can be found in the ITU-T Recommendations. Appendix A of this document provides an overview about the extensive ITU-T documentation in this area. The same considerations can be applied to the RFC 4054 [RFC4054]

2. The Internet-Standard Management Framework

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

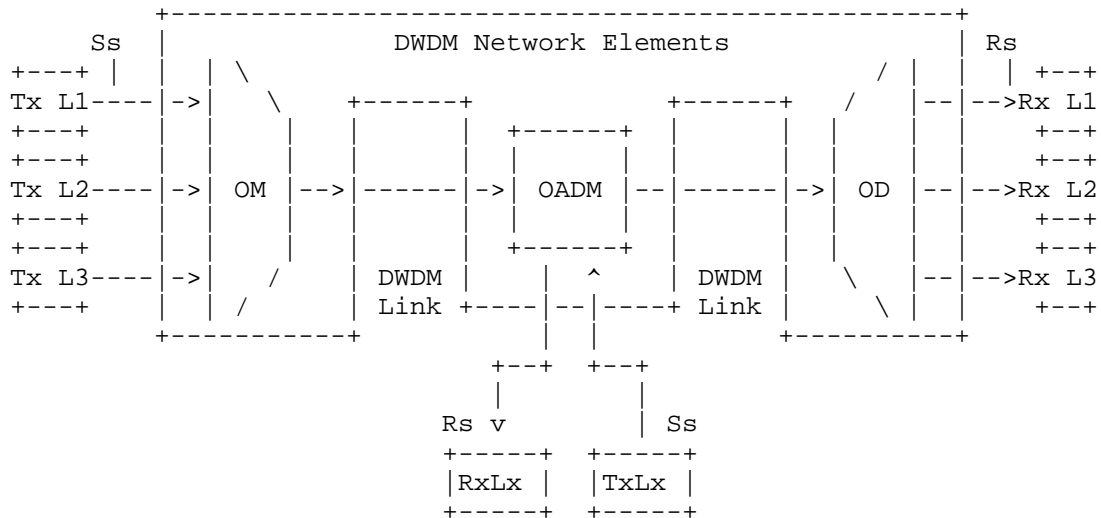
Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information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

3. Conventions

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 [RFC2119] In the description of OIDs the convention: Set (S) Get (G) and Trap (T) conventions will describe the action allowed by the parameter.

4. Overview

Figure 1 shows a set of reference points, for the linear "black link" approach, for single-channel connection (Ss and Rs) between transmitters (Tx) and receivers (Rx). Here the DWDM network elements include an OM and an OD (which are used as a pair with the opposing element), one or more optical amplifiers and may also include one or more OADMs.



Ss = reference point at the DWDM network element tributary output
Rs = reference point at the DWDM network element tributary input
Lx = Lambda x
OM = Optical Mux
OD = Optical Demux
OADM = Optical Add Drop Mux

from Fig. 5.1/G.698.2

Figure 1: Linear Black Link

G.698.2 [ITU.G698.2] defines also Ring Black Link configurations [Fig. 5.2/G.698.2] and Bidirectional Black Link configurations [Fig. 5.3/G.698.2]

4.1. Optical Parameters Description

The black links are managed at the edges, i.e. at the transmitters (Tx) and receivers (Rx) attached to the S and R reference points respectively. The parameters that could be managed at the black link

edges are specified in G.698.2 [ITU.G698.2] section 5.3 referring the "application code" notation

The definitions of the optical parameters are provided below to increase the readability of the document, where the definition is ended by (G) the parameter can be retrieve with a GET, when (S) it can be provisioned by a SET, (G,S) can be either GET and SET.

To support the management of these parameters, the SNMP MIB in RFC 3591 [RFC3591] is extended with a new MIB module defined in section 6 of this document. This new MIB module includes the definition of new configuration table of the OCh Layer for the parameters at Tx (S) and Rx (R).

4.1.1.1. Rs-Ss Configuration

The Rs-Ss configuration table allows configuration of Wavelength, Power and Application codes as described in [ITU.G698.2] and G.694.1 [ITU.G694.1]

This parameter report the current Transceiver Output power, it can be either a setting and measured value (G, S).

Wavelength Value (see G.694.1 Table 1):

This parameter indicates the wavelength value that Ss and Rs will be set to work (in THz) se in particular Section 6/G.694.1 (G, S).

Number of Vendor Transceiver Class Supported

This parameter indicates the number of Vendor Transceiver codes supported by this interface (G).

Single-channel application codes (see G.698.2):

This parameter indicates the transceiver application code at Ss and Rs as defined in [ITU.G698.2] Chapter 5.4 - this parameter can be called Optical Interface Identifier OII as per [draft-martinelli-wson-interface-class] (G).

Number of Single-channel application codes Supported

This parameter indicates the number of Single-channel application codes supported by this interface (G).

Current Laser Output power:

This parameter report the current Transceiver Output power, it can be either a setting and measured value (G, S).

Current Laser Input power:

This parameter report the current Transceiver Input power (G).

PARAMETERS	Get/Set	Reference
Wavelength Value	G,S	G.694.1 S.6
Vendor Transceiver Class	G	N.A.
Number of Vendor Transceiver Class Supported	G	N.A.
Single-channel application codes	G	G.698.2 S.5.3
Number of Single-channel application codes Supported	G	N.A.
Current Output Power	G,S	N.A.
Current Input Power	G	N.A.

Table 1: Rs-Ss Configuration

4.1.2. Table of Application Codes

This table has a list of Application codes supported by this interface at point R are defined in G.698.2.

Application code Identifier:

The Identifier for the Application code.

Application code:

This is the application code that is defined in G.698.2.

4.1.3. Table of Vendor Application Codes

This table has a list of Application codes supported by this interface at point R are defined in G.698.2.

Vendor Transceiver Class Identifier::

The Identifier for the vendor transceiver class.

Vendor Transceiver Class:

Other than specifying all the Transceiver parameter, it might be convenient for the vendors to summarize a set of parameters in a single proprietary parameter: the Class of transceiver. The Transceiver classification will be based on the Vendor Name and the main TX and RX parameters (i.e. Trunk Mode, Framing, Bit rate, Trunk Type, Channel Band, Channel Grid, Modulation Format, Channel Modulation Format, FEC Coding, Electrical Signal Framing at Tx, Minimum maximum Chromatic Dispersion (CD) at Rx, Maximum Polarization Mode Dispersion (PMD) at Rx, Maximum differential

group delay at Rx, Loopbacks, TDC, Pre-FEC BER, Q-factor, Q-margin, etc.). If this parameter is used, the MIB parameters specifying the Transceiver characteristics may not be significant and the vendor will be responsible to specify the Class contents and values. The Vendor can publish the parameters of its Classes or declare to be compatible with published Classes. (G) Optional for compliance. (not mentioned in G.698)

4.2. Use of ifTable

This section specifies how the MIB II interfaces group, as defined in RFC 2863 [RFC2863], is used for the link ends of a black link. Only the ifGeneralInformationGroup will be supported for the ifTable and the ifStackTable to maintain the relationship between the OCh and OPS layers. The OCh and OPS layers are managed in the ifTable using IfEntries that correlate to the layers depicted in Figure 1.

For example, a device with TX and/or RX will have an Optical Physical Section (OPS) layer, and an Optical Channel (OCh) layer. There is a one to n relationship between the OPS and OCh layers.

EDITOR NOTE: Reason for changing from OChr to OCh: Work on revised G.872 in the SG15 December 2011 meeting agreed to remove OChr from the architecture and to update G.709 to account for this architectural change. The meeting also agreed to consent the revised text of G.872 and G.709 at the September 2012 SG15 meeting.

Figure 2 In the following figures, opticalChannel and opticalPhysicalSection are abbreviated as OCh and ops respectively.

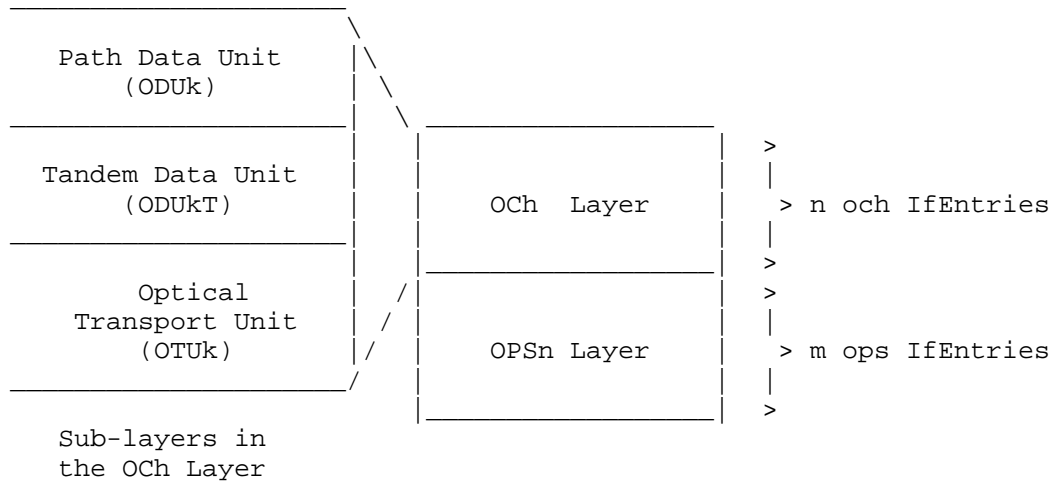


Figure 2: OTN Layers for OPS and OCh

Each opticalChannel IfEntry is mapped to one of the m opticalPhysicalSection IfEntries, where m is greater than or equal to 1. Conversely, each opticalTransPhysicalSection port entry is mapped to one of the n opticalChannel IfEntries, where n is greater than or equal to 1.

The design of the Optical Interface MIB provides the option to model an interface either as a single bidirectional object containing both sink and source functions or as a pair of unidirectional objects, one containing sink functions and the other containing source functions.

If the sink and source for a given protocol layer are to be modelled as separate objects, then there need to be two ifTable entries, one that corresponds to the sink and one that corresponds to the source, where the directionality information is provided in the configuration tables for that layer via the associated Directionality objects. The agent is expected to maintain consistent directionality values between ifStackTable layers (e.g., a sink must not be stacked in a 1:1 manner on top of a source, or vice-versa), and all protocol layers that are represented by a given ifTable entry are expected to have the same directionality.

When separate ifTable entries are used for the source and sink functions of a given physical interface, association between the two uni-directional ifTable entries (one for the source function and the other for the sink functions) should be provided. It is recommended that identical ifName values are used for the two ifTable entries to indicate such association. An implementation shall explicitly state what mechanism is used to indicate the association, if ifName is not used.

4.2.1. Use of ifTable for OPS Layer

Only the ifGeneralInformationGroup needs to be supported.

ifTable Object	Use for OTN OPS Layer
=====	
ifIndex	The interface index.
ifDescr	Optical Transport Network (OTN) Optical Physical Section (OPS)
ifType	opticalPhysicalSection (xxx)
<<<Editor Note: Need new IANA registration value for xxx. >>>	
ifSpeed	Actual bandwidth of the interface in bits per second. If the bandwidth of the interface is greater than the maximum value of 4,294,967,295, then the maximum value is reported and ifHighSpeed must be used to report the interface's speed.
ifPhysAddress	An octet string with zero length. (There is no specific address associated with the interface.)
ifAdminStatus	The desired administrative state of the interface. Supports read-only access.
ifOperStatus	The operational state of the interface. The value lowerLayerDown(7) is not used, since there is no lower layer interface. This object is set to notPresent(6) if a component is missing, otherwise it is set to down(2) if either of the objects optIfOPSnCurrentStatus indicates that any defect is present.

ifLastChange	The value of sysUpTime at the last change in ifOperStatus.
ifName	Enterprise-specific convention (e.g., TL-1 AID) to identify the physical or data entity associated with this interface or an OCTET STRING of zero length. The enterprise-specific convention is intended to provide the means to reference one or more enterprise-specific tables.
ifLinkUpDownTrapEnable	Default value is enabled(1). Supports read-only access.
ifHighSpeed	Actual bandwidth of the interface in Mega-bits per second. A value of n represents a range of 'n-0.5' to 'n+0.499999'.
ifConnectorPresent	Set to true(1).
ifAlias	The (non-volatile) alias name for this interface as assigned by the network manager.

4.2.2. Use of ifTable for OCh Layer

Use of ifTable for OCh Layer See RFC 3591 [RFC3591] section 2.4

4.2.3. Use of ifStackTable

Use of the ifStackTable and ifInvStackTable to associate the opticalPhysicalSection and opticalChannel interface entries is best illustrated by the example shown in Figure 3. The example assumes an ops interface with ifIndex i that carries two multiplexed OCh interfaces with ifIndex values of j and k, respectively. The example shows that j and k are stacked above (i.e., multiplexed into) i. Furthermore, it shows that there is no layer lower than i and no layer higher than j and/or k.

Figure 3

HigherLayer	LowerLayer
0	j
0	k
j	i
k	i
i	0

Figure 3: Use of ifStackTable for an OTN port

For the inverse stack table, it provides the same information as the interface stack table, with the order of the Higher and Lower layer interfaces reversed.

5. Structure of the MIB Module

EDITOR NOTE: text will be provided based on the MIB module in Section 6

6. Object Definitions

EDITOR NOTE: Once the scope in Section 1 and the parameters in Section 4 are finalized, a MIB module will be defined. It could be an extension to the OPT-IF-MIB module of RFC 3591. >>>

OPT-IF-698-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY,
OBJECT-TYPE,
Gauge32,
Integer32,
Unsigned32,
Counter64,
transmission,
NOTIFICATION-TYPE
FROM SNMPv2-SMI
TEXTUAL-CONVENTION,
RowPointer,
RowStatus,
TruthValue,
DisplayString,
DateAndTime
FROM SNMPv2-TC
SnmpAdminString
FROM SNMP-FRAMEWORK-MIB
MODULE-COMPLIANCE, OBJECT-GROUP
FROM SNMPv2-CONF
ifIndex
FROM IF-MIB
optIfMibModule
FROM OPT-IF-MIB;

-- This is the MIB module for the optical parameters -
-- Application codes associated with the black link end points.

```
optIfXcvrMibModule MODULE-IDENTITY
    LAST-UPDATED "201401270000Z"
    ORGANIZATION "IETF Ops/Camp MIB Working Group"
    CONTACT-INFO
        "WG charter:
         http://www.ietf.org/html.charters/

        Mailing Lists:
        Editor: Gabriele Galimberti
        Email: ggalimbe@cisco.com"
    DESCRIPTION
        "The MIB module to describe Black Link tranceiver
        characteristics to rfc3591.
        Copyright (C) The Internet Society (2014). This version
        of this MIB module is an extension to rfc3591; see the RFC
        itself for full legal notices."
    REVISION "201305050000Z"
    DESCRIPTION
        "Draft version 1.0"
    REVISION "201305050000Z"
    DESCRIPTION
        "Draft version 2.0"
    REVISION "201302270000Z"
    DESCRIPTION
        "Draft version 3.0"
    REVISION "201307020000Z"
    DESCRIPTION
        "Draft version 4.0
        Changed the draft to include only the G.698 parameters."
    REVISION "201311020000Z"
    DESCRIPTION
        "Draft version 5.0
        Mib has a table of application code/vendor transcievercode G.698."
    REVISION "201401270000Z"
    DESCRIPTION
        "Draft version 6.0"
    ::= { optIfMibModule 4 }

-- Addition to the RFC 3591 objects
optIfOchSsRsGroup OBJECT IDENTIFIER ::= { optIfXcvrMibModule 1 }
```

```
-- OCh Ss/Rs config table
-- The application code/vendor transceiver class for the Black Link
-- Ss-Rs will be added to the OchConfigTable
```

```
optIfOChSsRsConfigTable OBJECT-TYPE
    SYNTAX SEQUENCE OF OptIfOChSsRsConfigEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "A table of Och General config extension parameters"
    ::= { optIfOChSsRsGroup 1 }
```

```
optIfOChSsRsConfigEntry OBJECT-TYPE
    SYNTAX OptIfOChSsRsConfigEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "A conceptual row that contains G.698 parameters for an
        interface."
    INDEX { ifIndex }
    ::= { optIfOChSsRsConfigTable 1 }
```

```
OptIfOChSsRsConfigEntry ::=
    SEQUENCE {
        optIfOChWavelengthn                Unsigned32,
        optIfOChInterfaceVendorTransceiverClass DisplayString,
        optIfOChNumberVendorClassesSupported Unsigned32,
        optIfOChInterfaceApplicationCode    DisplayString,
        optIfOChNumberApplicationCodesSupported Unsigned32,
        optIfOChOutputPower                  Integer32,
        optIfOChInputPower                   Integer32
    }
```

```
optIfOChWavelengthn OBJECT-TYPE
    SYNTAX Unsigned32
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        " This parameter indicate minimum wavelength spectrum - n, in
        a definite wavelength Band (L, C and S) as represented in
        [RFC6205] by the formula -
        Wavelength (nm ) = 1471nm + n* optIfOChMimumumChannelSpacing
                                (converted to nm)
        Eg - optIfOChMimumumChannelSpacing in nm
        'Wavelength (nm ) = 1471nm + n* 20nm (20nm is the spacing
        for CWDM)'
        "
    ::= { optIfOChSsRsConfigEntry 1 }
```

```
optIfOChInterfaceVendorTransceiverClass OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "As defined in G.698
        Vendors can summarize a set of parameters in a
        single proprietary parameter: the Class of transceiver. The
        Transceiver classification will be based on the Vendor Name
        and the main TX and RX parameters (i.e. Trunk Mode, Framing,
        Bit rate, Trunk Type etc).
        This defines the tranceiver class that is/should be used by
        this interface. The optIfOChSrcVendorTranscieverClassTable
        has all the vendor classes supported by this interface."

    ::= { optIfOChSsRsConfigEntry 2 }

optIfOChNumberVendorClassesSupported OBJECT-TYPE
    SYNTAX Unsigned32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " Number of Vedor classes supported by this interface."
    ::= { optIfOChSsRsConfigEntry 3 }

optIfOChInterfaceApplicationCode OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "This parameter indicates the transceiver application code at
        Ss and Rs as defined in [ITU.G698.2] Chapter 5.3, that
        is/should be used by this interface. The
        optIfOChSrcApplicationCodeTable has all the application
        codes supported by this interface. "
    ::= { optIfOChSsRsConfigEntry 4 }

optIfOChNumberApplicationCodesSupported OBJECT-TYPE
    SYNTAX Unsigned32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " Number of Application codes supported by this interface."
    ::= { optIfOChSsRsConfigEntry 5 }

optIfOChOutputPower OBJECT-TYPE
    SYNTAX Integer32
    UNITS "0.01dbm"
```



```
MAX-ACCESS read-write
STATUS current
DESCRIPTION
    " The output power for this interface in .01 dbm "
 ::= { optIfOChSsRsConfigEntry 6 }

optIfOChInputPower OBJECT-TYPE
    SYNTAX Integer32
    UNITS "0.01dbm"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " The input power for this interface in .01 dbm "
    ::= { optIfOChSsRsConfigEntry 7 }

-- Table of Application codes supported by the interface
-- OptIfOChSrcApplicationCodeEntry

optIfOChSrcApplicationCodeTable OBJECT-TYPE
    SYNTAX SEQUENCE OF OptIfOChSrcApplicationCodeEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "A Table of Application codes supported by this interface."
    ::= { optIfOChSsRsGroup 2 }

optIfOChSrcApplicationCodeEntry OBJECT-TYPE
    SYNTAX OptIfOChSrcApplicationCodeEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "A conceptual row that contains the Application code for this
        interface."
    INDEX { ifIndex, optIfOChApplicationCodeIdentifier }
    ::= { optIfOChSrcApplicationCodeTable 1 }

OptIfOChSrcApplicationCodeEntry ::=
    SEQUENCE {
        optIfOChApplicationCodeIdentifier Integer32,
        optIfOChApplicationCode DisplayString
    }

optIfOChApplicationCodeIdentifier OBJECT-TYPE
    SYNTAX Integer32 (1..255)
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
```

```

    " The number/identifier of the application code supported at this
      interface. The interface can support more than one
      application codes.
    "
    ::= { optIfOChSrcApplicationCodeEntry 1}

optIfOChApplicationCode OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " The application code supported by this interface DWDM
          link."
    ::= { optIfOChSrcApplicationCodeEntry 2}

-- Table of Vendor Transceiver class supported by the interface
-- OptIfOChSrcVendorTransceiverClassEntry

optIfOChSrcVendorTransceiverClassTable OBJECT-TYPE
    SYNTAX SEQUENCE OF OptIfOChSrcVendorTransceiverClassEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "A table of OCh Src (Ss) transceiver classes supported by
          this interface."
    ::= { optIfOChSsRsGroup 3 }

optIfOChSrcVendorTransceiverClassEntry OBJECT-TYPE
    SYNTAX OptIfOChSrcVendorTransceiverClassEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "A conceptual row that contains the transceiver classes
          supported by this interface."
    INDEX { ifIndex, optIfOChTransceiverClassIdentifier }
    ::= { optIfOChSrcVendorTransceiverClassTable 1 }

OptIfOChSrcVendorTransceiverClassEntry ::=
    SEQUENCE {
        optIfOChTransceiverClassIdentifier      Integer32,
        optIfOChTransceiverClass                DisplayString
    }

optIfOChTransceiverClassIdentifier OBJECT-TYPE
    SYNTAX Integer32 (1..255)
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION

```

```
" The number/identifer of the application code supported at this
  interface. The interface can support more than one
  application codes.
"
 ::= { optIfOChSrcVendorTranscieverClassEntry 1}

optIfOChTranscieverClass OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " Vendor tranceiver class supported by this interface."
    ::= { optIfOChSrcVendorTranscieverClassEntry 2}

-- Notifications

-- Wavelength Change Notification
optIfOChWavelengthChange NOTIFICATION-TYPE
    OBJECTS { optIfOChWavelengthn }
    STATUS current
    DESCRIPTION
        "Notification of a change in the wavelength."
    ::= { optIfXcvrMibModule 1 }

END
```

7. Relationship to Other MIB Modules

7.1. Relationship to the [TEMPLATE TODO] MIB

7.2. MIB modules required for IMPORTS

8. Definitions

[TEMPLATE TODO]: put your valid MIB module here.
A list of tools that can help automate the process of
checking MIB definitions can be found at
<http://www.ops.ietf.org/mib-review-tools.html>

9. Security Considerations

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

network operations. These are the tables and objects and their sensitivity/vulnerability:

o

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

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

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

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

10. IANA Considerations

Option #1:

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

Descriptor	OBJECT IDENTIFIER value
-----	-----
sampleMIB	{ mib-2 XXX }

Option #2:

Editor's Note (to be removed prior to publication): the IANA is requested to assign a value for "XXX" under the 'mib-2' subtree and to record the assignment in the SMI Numbers registry. When the

assignment has been made, the RFC Editor is asked to replace "XXX" (here and in the MIB module) with the assigned value and to remove this note.

Note well: prior to official assignment by the IANA, an internet draft MUST use place holders (such as "XXX" above) rather than actual numbers. See RFC4181 Section 4.5 for an example of how this is done in an internet draft MIB module.

Option #3:

This memo includes no request to IANA.

11. Contributors

Arnold Mattheus
Deutsche Telekom
Darmstadt
Germany
email a.mattheus@telekom.de

Manuel Paul
Deutsche Telekom
Berlin
Germany
email Manuel.Paul@telekom.de

Frank Luennemann
Deutsche Telekom
Munster
Germany
email Frank.Luennemann@telekom.de

Scott Mansfield
Ericsson Inc.
email scott.mansfield@ericsson.com

Najam Saquib
Cisco
Ludwig-Erhard-Strasse 3
ESCHBORN, HESSEN 65760
GERMANY
email nasaquib@cisco.com

Walid Wakim
Cisco
9501 Technology Blvd
ROSEMONT, ILLINOIS 60018
UNITED STATES
email wwakim@cisco.com

Ori Gerstel
Cisco
32 HaMelacha St., (HaSharon Bldg)
SOUTH NETANYA, HAMERKAZ 42504
ISRAEL
email ogerstel@cisco.com

12. References

12.1. Normative References

- [RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", RFC 2863, June 2000.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC2578] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.
- [RFC2579] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.
- [RFC3591] Lam, H-K., Stewart, M., and A. Huynh, "Definitions of Managed Objects for the Optical Interface Type", RFC 3591, September 2003.
- [RFC6205] Otani, T. and D. Li, "Generalized Labels for Lambda-Switch-Capable (LSC) Label Switching Routers", RFC 6205, March 2011.
- [ITU.G698.2] International Telecommunications Union, "Amplified multichannel dense wavelength division multiplexing applications with single channel optical interfaces", ITU-T Recommendation G.698.2, November 2009.
- [ITU.G709] International Telecommunications Union, "Interface for the Optical Transport Network (OTN)", ITU-T Recommendation G.709, March 2003.
- [ITU.G872] International Telecommunications Union, "Architecture of optical transport networks", ITU-T Recommendation G.872, November 2001.

- [ITU.G798]
International Telecommunications Union, "Characteristics of optical transport network hierarchy equipment functional blocks", ITU-T Recommendation G.798, October 2010.
- [ITU.G874]
International Telecommunications Union, "Management aspects of optical transport network elements", ITU-T Recommendation G.874, July 2010.
- [ITU.G874.1]
International Telecommunications Union, "Optical transport network (OTN): Protocol-neutral management information model for the network element view", ITU-T Recommendation G.874.1, January 2002.
- [ITU.G959.1]
International Telecommunications Union, "Optical transport network physical layer interfaces", ITU-T Recommendation G.959.1, November 2009.
- [ITU.G826]
International Telecommunications Union, "End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections", ITU-T Recommendation G.826, November 2009.
- [ITU.G8201]
International Telecommunications Union, "Error performance parameters and objectives for multi-operator international paths within the Optical Transport Network (OTN)", ITU-T Recommendation G.8201, April 2011.
- [ITU.G694.1]
International Telecommunications Union, "Spectral grids for WDM applications: DWDM frequency grid", ITU-T Recommendation G.694.1, June 2002.
- [ITU.G7710]
International Telecommunications Union, "Common equipment management function requirements", ITU-T Recommendation G.7710, May 2008.

12.2. Informative References

- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart,
"Introduction and Applicability Statements for Internet-
Standard Management Framework", RFC 3410, December 2002.
- [RFC2629] Rose, M., "Writing I-Ds and RFCs using XML", RFC 2629,
June 1999.
- [RFC4181] Heard, C., "Guidelines for Authors and Reviewers of MIB
Documents", BCP 111, RFC 4181, September 2005.
- [I-D.kunze-g-698-2-management-control-framework]
Kunze, R., "A framework for Management and Control of
optical interfaces supporting G.698.2", draft-
kunze-g-698-2-management-control-framework-00 (work in
progress), July 2011.
- [RFC4054] Strand, J. and A. Chiu, "Impairments and Other Constraints
on Optical Layer Routing", RFC 4054, May 2005.

Appendix A. Change Log

This optional section should be removed before the internet draft is submitted to the IESG for publication as an RFC.

Note to RFC Editor: please remove this appendix before publication as an RFC.

Appendix B. Open Issues

Note to RFC Editor: please remove this appendix before publication as an RFC.

Authors' Addresses

Gabriele Galimberti (editor)
Cisco
Via Philips,12
20052 - Monza
Italy

Phone: +390392091462
Email: ggalimbe@cisco.com

Ruediger Kunze (editor)
Deutsche Telekom
Dddd, xx
Berlin
Germany

Phone: +49xxxxxxxxxx
Email: RKunze@telekom.de

Hing-Kam Lam (editor)
Alcatel-Lucent
600-700 Mountain Avenue, Murray Hill
New Jersey, 07974
USA

Phone: +17323313476
Email: kam.lam@alcatel-lucent.com

Dharini Hiremagalur (editor)
Juniper
1194 N Mathilda Avenue
Sunnyvale - 94089 California
USA

Phone: +1408
Email: dharinih@juniper.net