

Internet Engineering Task Force
Internet-Draft
Intended status: Standards Track
Expires: January 7, 2016

G.Galimberti, Ed.
Cisco
R.Kunze, Ed.
Deutsche Telekom
Kam Lam, Ed.
Alcatel-Lucent
D. Hiremagalur, Ed.
Juniper
L.Fang, Ed.
G.Ratterree, Ed.
Microsoft
July 6, 2015

An SNMP MIB extension to RFC3591 to manage optical interface parameters
of "G.698.2 single channel" in DWDM applications
draft-galikunze-ccamp-g-698-2-snmp-mib-12

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 single channel optical interface parameters of DWDM applications, using the approach specified in G.698.2 [ITU.G698.2] . This interface, described in ITU-T G.872, G.709 and G.798, is one type of OTN multi-vendor Intra-Domain Interface (IaDI). This RFC is an extension of RFC3591 to support the optical parameters specified in ITU-T G.698.2 and application identifiers specified in ITU-T G.874.1 [ITU.G874.1]. Note that G.874.1 encompasses vendor-specific codes, which if used would make the interface a single vendor IaDI and could still be managed.

The MIB module defined in this memo can be used for Optical Parameters monitoring and/or configuration of the endpoints of the multi-vendor IaDI based on the Black Link approach.

Copyright Notice

Copyright (c) 2015 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 January 7, 2016.

Copyright Notice

Copyright (c) 2015 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	5
4. Overview	5
4.1. Use Cases	6
4.2. Optical Parameters Description	13
4.2.1. Rs-Ss Configuration	13
4.2.2. Table of Application Identifiers	14
4.3. Use of ifTable	15
4.3.1. Use of ifTable for OPS Layer	16
4.3.2. Use of ifTable for OCh Layer	17
4.3.3. Use of ifStackTable	17
5. Structure of the MIB Module	18
6. Object Definitions	18
7. Relationship to Other MIB Modules	25
7.1. Relationship to the [TEMPLATE TODO] MIB	25
7.2. MIB modules required for IMPORTS	25
8. Definitions	25
9. Security Considerations	25

10. IANA Considerations	26
11. Contributors	26
12. References	27
12.1. Normative References	27
12.2. Informative References	29
Appendix A. Change Log	30
Appendix B. Open Issues	30
Authors' Addresses	30

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 single channel optical interface parameters of DWDM applications, using the approach specified in G.698.2. This RFC is an extension of RFC3591 to support the optical parameters specified in ITU-T G.698.2 [ITU.G698.2] and application identifiers specified in ITU-T G.874.1 [ITU.G874.1]. Note that G.874.1 encompasses vendor-specific codes, which if used would make the interface a single vendor IaDI and could still be managed.

The Black Link approach allows supporting an optical transmitter/receiver pair of one vendor to inject an optical tributary signal and run it over an optical network composed of amplifiers, filters, add-drop multiplexers from a different vendor. In the OTN architecture, the 'black-link' represents a pre-certified network media channel conforming to G.698.2 specifications at the S and R reference points.

[Editor's note: In G.698.2 this corresponds to the optical path from point S to R; network media channel is also used and explained in draft-ietf-ccamp-flexi-grid-fwk-02]

Management will be performed at the edges of the network media channel (i.e., at 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 in G.7710/Y.1701 [ITU-T G.7710] and G.874.1 [ITU.G874.1].

G.698.2 [ITU.G698.2] is primarily intended for metro applications that 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 explicitly specify the details of the optical network between reference point Ss and Rs, e.g., the passive

and active elements or details of the design. 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] and included in the Application Identifier defined in G.874.1 [ITU.G874.1] and G.872 [ITU.G872], plus a few optical parameters not included in the G.698.2 application code specification.

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], and reflected in G.874.1 [ITU.G874], allows the different vendors and operator to retrieve, provision and exchange information across the G.698.2 multi-vendor IaDI in a standardized way.

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, as this RFC is over a decade old, it is primarily pre-OTN, and a more complete and up-to-date description of optical parameters and processes can be found in the relevant ITU-T Recommendations. 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].

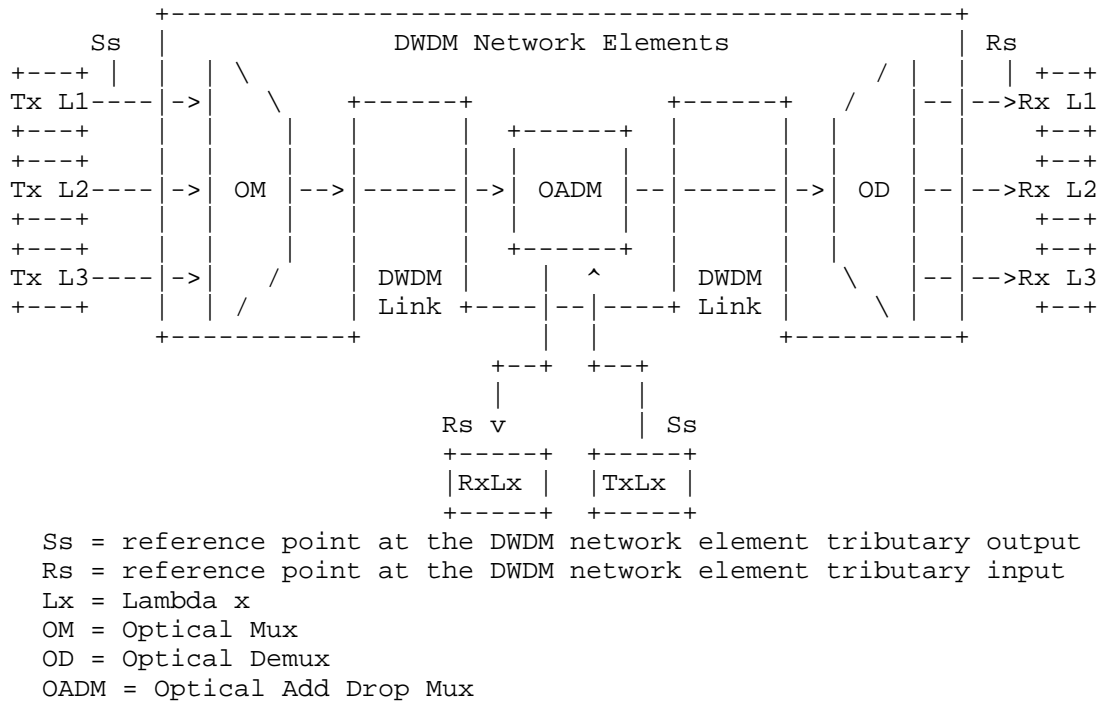
Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (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.



from Fig. 5.1/G.698.2

Figure 1: Linear Black Link approach

G.698.2 [ITU.G698.2] defines also Ring "Black Link" approach configurations [Fig. 5.2/G.698.2] and Linear "black link" approach for Bidirectional applications[Fig. 5.3/G.698.2]

4.1. Use Cases

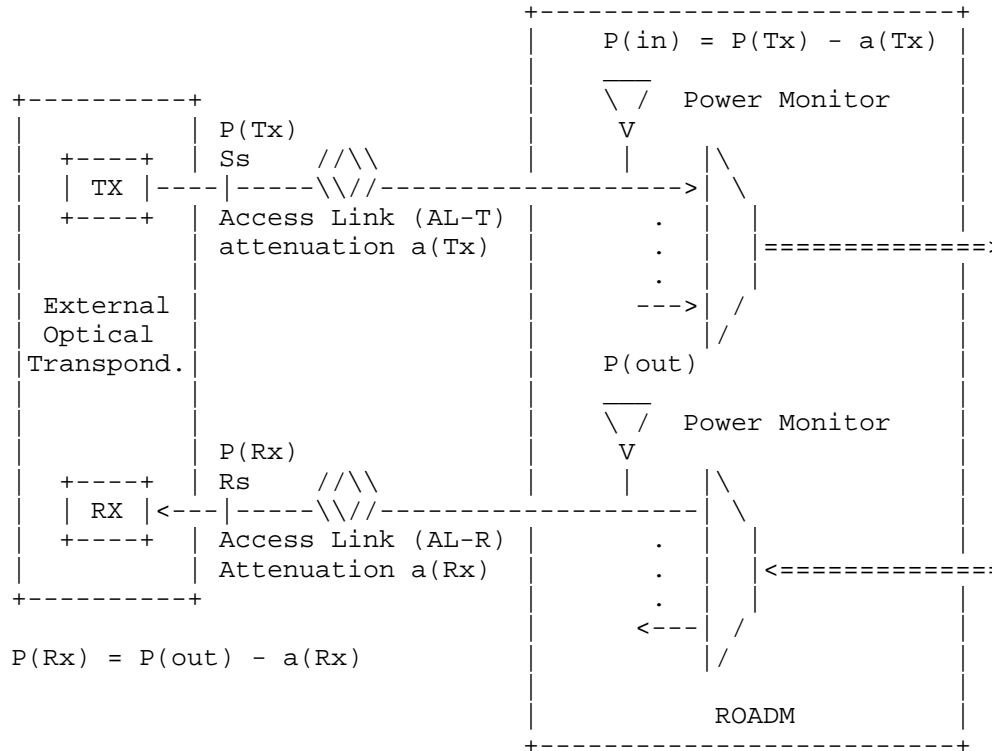
The use cases described below are assuming that power monitoring functions are available in the ingress and egress network element of the DWDM network, respectively. By performing link property correlation it would be beneficial to include the current transmit power value at reference point Ss and the current received power value at reference point Rs. For example if the Client transmitter power (OXC1) has a value of 0dBm and the ROADM interface measured power (at OLS1) is -6dBm the fiber patch cord connecting the two nodes may be pinched or the connectors are dirty. More, the interface characteristics can be used by the OLS network Control Plane in order to check the Optical Channels feasibility. Finally the OXC1 transceivers parameters (Application Code) can be shared with OXC2 using the LMP protocol to verify the Transceivers compatibility. The actual route selection of a specific wavelength within the allowed set is outside the scope of LMP. In GMPLS, the parameter selection (e.g. central frequency) is performed by RSVP-TE.

G.698.2 defines a single channel optical interface for DWDM systems that allows interconnecting network-external optical transponders across a DWDM network. The optical transponders are considered to be external to the DWDM network. This so-called 'black link' approach illustrated in Figure 5-1 of G.698.2 and a copy of this figure is provided below. The single channel fiber link between the Ss/Rs reference points and the ingress/egress port of the network element on the domain boundary of the DWDM network (DWDM border NE) is called access link in this contribution. Based on the definition in G.698.2 it is considered to be part of the DWDM network. The access link typically is realized as a passive fiber link that has a specific optical attenuation (insertion loss). As the access link is an integral part of the DWDM network, it is desirable to monitor its attenuation. Therefore, it is useful to detect an increase of the access link attenuation, for example, when the access link fiber has been disconnected and reconnected (maintenance) and a bad patch panel connection (connector) resulted in a significantly higher access link attenuation (loss of signal in the extreme case of an open connector or a fiber cut). In the following section, two use cases are presented and discussed:

- 1) pure access link monitoring
- 2) access link monitoring with a power control loop

These use cases require a power monitor as described in G.697 (see section 6.1.2), that is capable to measure the optical power of the incoming or outgoing single channel signal. The use case where a power control loop is in place could even be used to compensate an increased attenuation as long as the optical transmitter can still be operated within its output power range defined by its application code.

Figure 2 Access Link Power Monitoring



- For AL-T monitoring: $P(Tx)$ and $a(Tx)$ must be known
- For AL-R monitoring: $P(Rx)$ and $a(Rx)$ must be known

An alarm shall be raised if $P(in)$ or $P(Rx)$ drops below a configured threshold (t [dB]):

- $P(in) < P(Tx) - a(Tx) - t$ (Tx direction)
- $P(Rx) < P(out) - a(Rx) - t$ (Rx direction)
- $a(Tx) = | a(Rx)$

Figure 2: Extended LMP Model

Pure Access Link (AL) Monitoring Use Case

Figure 4 illustrates the access link monitoring use case and the different physical properties involved that are defined below:

- S_s, R_s : G.698.2 reference points
- $P(Tx)$: current optical output power of transmitter Tx
- $a(Tx)$: access link attenuation in Tx direction (external transponder point of view)
- $P(in)$: measured current optical input power at the input port of border DWDM NE
- t : user defined threshold (tolerance)
- $P(out)$: measured current optical output power at the output port of border DWDM NE
- $a(Rx)$: access link attenuation in Rx direction (external transponder point of view)
- $P(Rx)$: current optical input power of receiver Rx

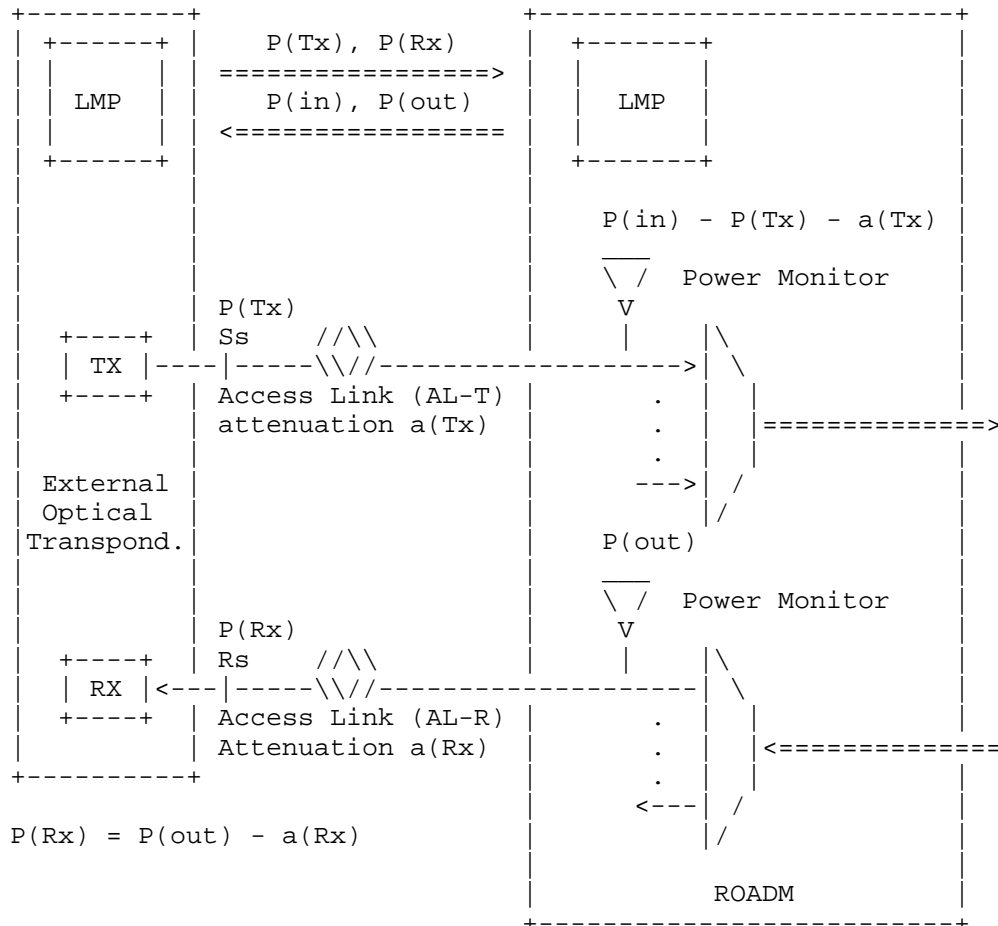
Assumptions:

- The access link attenuation in both directions ($a(Tx)$, $a(Rx)$) is known or can be determined as part of the commissioning process. Typically, both values are the same.
- A threshold value t has been configured by the operator. This should also be done during commissioning.
- A control plane protocol is in place that allows to periodically send the optical power values $P(Tx)$ and $P(Rx)$ to the control plane protocol instance on the DWDM border NE. This is illustrated in Figure 3.
- The DWDM border NE is capable to periodically measure the optical power P_{in} and P_{out} as defined in G.697 by power monitoring points depicted as yellow triangles in the figures below.

AL monitoring process:

- Tx direction: the measured optical input power P_{in} is compared with the expected optical input power $P(Tx) - a(Tx)$. If the measured optical input power P_{in} drops below the value $(P(Tx) - a(Tx) - t)$ a low power alarm shall be raised indicating that the access link attenuation has exceeded $a(Tx) + t$.
- Rx direction: the measured optical input power $P(Rx)$ is compared with the expected optical input power $P(out) - a(Rx)$. If the measured optical input power $P(Rx)$ drops below the value $(P(out) - a(Rx) - t)$ a low power alarm shall be raised indicating that the access link attenuation has exceeded $a(Rx) + t$.

Figure 3 Use case 1: Access Link power monitoring



- For AL-T monitoring: $P(Tx)$ and $a(Tx)$ must be known
 - For AL-R monitoring: $P(Rx)$ and $a(Rx)$ must be known
- An alarm shall be raised if $P(in)$ or $P(Rx)$ drops below a configured threshold (t [dB]):
- $P(in) < P(Tx) - a(Tx) - t$ (Tx direction)
 - $P(Rx) < P(out) - a(Rx) - t$ (Rx direction)
 - $a(Tx) = a(Rx)$

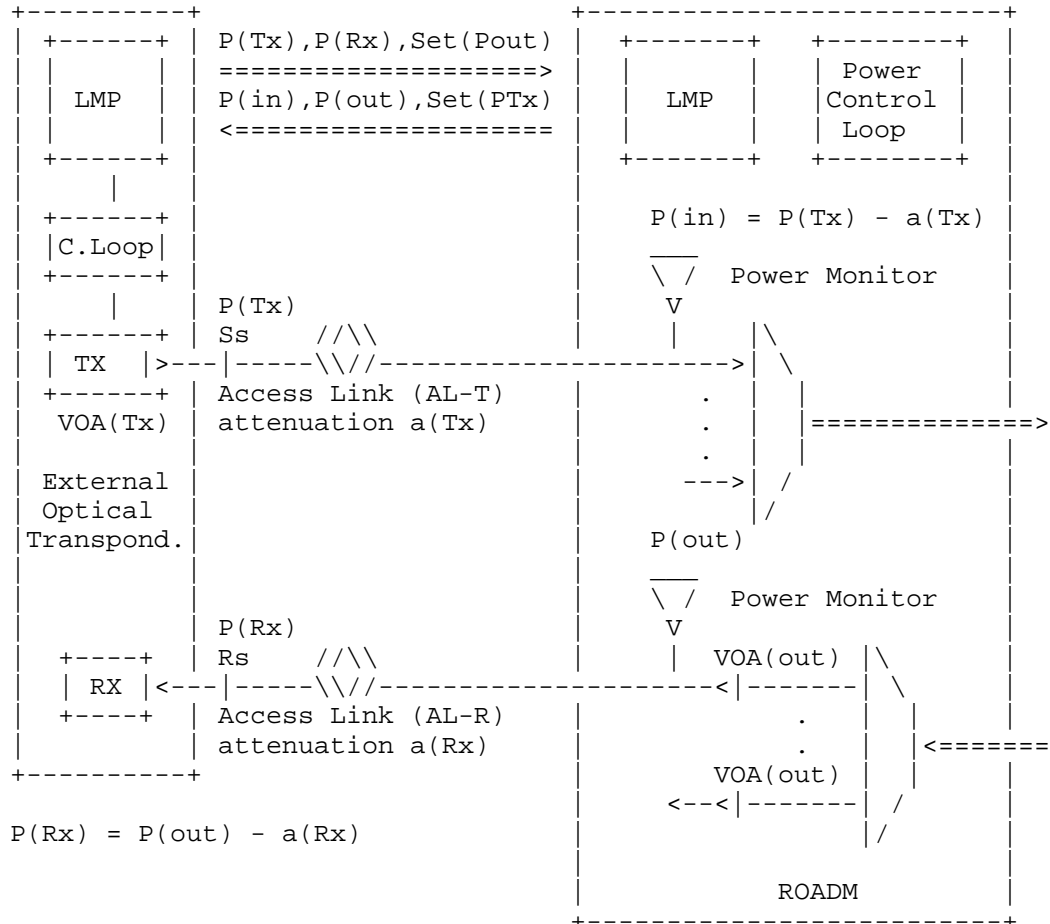
Figure 3: Extended LMP Model

Power Control Loop Use Case

This use case is based on the access link monitoring use case as described above. In addition, the border NE is running a power control application that is capable to control the optical output power of the single channel tributary signal at the output port of the border DWDM NE (towards the external receiver Rx) and the optical output power of the single channel tributary signal at the external transmitter Tx within their known operating range. The time scale of this control loop is typically relatively slow (e.g. some 10s or minutes) because the access link attenuation is not expected to vary much over time (the attenuation only changes when re-cabling occurs).

From a data plane perspective, this use case does not require additional data plane extensions. It does only require a protocol extension in the control plane (e.g. this LMP draft) that allows the power control application residing in the DWDM border NE to modify the optical output power of the DWDM domain-external transmitter Tx within the range of the currently used application code. Figure 5 below illustrates this use case utilizing the LMP protocol with extensions defined in this draft.

Figure 4 Use case 2: Power Control Loop



The Power Control Loops in Transponder and ROADM regulate the Variable Optical Attenuators (VOA) to adjust the proper power in base of the ROADM and Receiver characteristics and the Access Link attenuation

Figure 4: Extended LMP Model

4.2. Optical Parameters Description

The G.698.2 pre-certified network media channels are managed at the edges, i.e. at the transmitters (Tx) and receivers (Rx) attached to the S and R reference points respectively. The set of parameters that could be managed 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).

4.2.1. Rs-Ss Configuration

The Rs-Ss configuration table allows configuration of Central Frequency, Power and Application identifiers 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).

Central frequency (see G.694.1 Table 1):

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

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

This parameter indicates the transceiver application identifier 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 identifiers 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, see RFC3591.

Current Laser Input power:

This parameter report the current Transceiver Input power see RFC3591.

PARAMETERS	Get/Set	Reference
Central Frequency	G,S	G.694.1 S.6
Single-channel Application Identifier number in use	G	G.874.1
Single-channel Application Identifier Type in use	G	G.874.1
Single-channel Application Identifier in use	G	G.874.1
Number of Single-channel Application Identifiers Supported	G	N.A.
Current Output Power	G,S	RFC3591
Current Input Power	G	RFC3591

Table 1: Rs-Ss Configuration

4.2.2. Table of Application Identifiers

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

Application Identifier Number:

The number that uniquely identifies the Application Identifier.

Application Identifier Type:

Type of application Identifier: STANDARD / PROPRIETARY in G.874.1

Note: if the A.I. type = PROPRIETARY, the first 6 Octets of the Application Identifier (PrintableString) must contain the Hexadecimal representation of an OUI (organizationally unique identifier) assigned to the vendor whose implementation generated the Application Identifier; the remaining octets of the PrintableString are unspecified.

Application Identifier:

This is the application Identifier that is defined in G.874.1.

4.3. 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 OCh layer. There is a one to n relationship between the OPS and OCh layers.

EDITOR NOTE: Reason for changing from OChr to OCh: Edition 3 of G.872 removed OChr from the architecture and G.709 was subsequently updated to account for this architectural change.

Figure 5 In the following figures, opticalPhysicalSection are abbreviated as OPS.

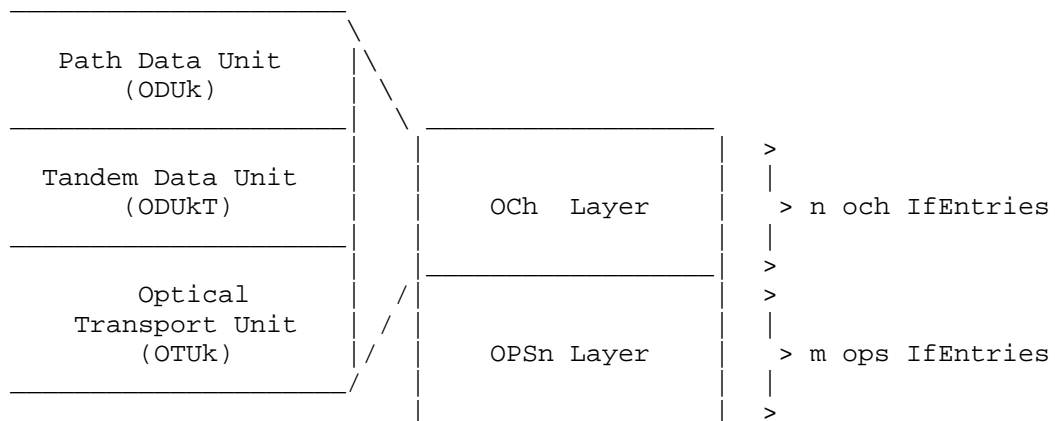


Figure 5: OTN Layers for OPS and OCh

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.

4.3.1. 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.

4.3.2. Use of ifTable for OCh Layer

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

4.3.3. 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 6

HigherLayer	LowerLayer

0	j
0	k
j	i
k	i
i	0

Figure 6: 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 transceivercode G.698"

REVISION "201401270000Z"

DESCRIPTION

"Draft version 6.0"

REVISION "201407220000Z"

DESCRIPTION

"Draft version 8.0"

Removed Vendor transceiver code"

REVISION "201502220000Z"

DESCRIPTION

"Draft version 11.0"

Added reference to OUI in the first 6 Octets of a proprietary Application code

Added a Length field for the Application code

Changed some names"

REVISION "201507060000Z"

DESCRIPTION

"Draft version 12.0"

Added Power Measurement Use Cases

and ITU description" "

::= { optIfMibModule 4 }

::= { 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 {
        optIfOChCentralFrequency                Unsigned32,
        optIfOChCfgApplicationIdentifierNumber   Unsigned32,
        optIfOChCfgApplicationIdentifierType     Unsigned32,
        optIfOChCfgApplicationIdentifierLength   Unsigned32,
        optIfOChCfgApplicationIdentifier         DisplayString,
        optIfOChNumberApplicationCodesSupported Unsigned32
    }
```

```
optIfOChCentralFrequency OBJECT-TYPE
    SYNTAX Unsigned32
    MAX-ACCESS read-write
    UNITS "THz"
    STATUS current
    DESCRIPTION
        " This parameter indicates the frequency of this interface.
        "
    ::= { optIfOChSsRsConfigEntry 1 }
```

```
optIfOChCfgApplicationIdentifierNumber OBJECT-TYPE
    SYNTAX Unsigned32
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "This parameter uniquely indicates the transceiver
```

```
        application code at Ss and Rs as defined in [ITU.G874.1],
        that is used by this interface.
        The optIfOChSrcApplicationIdentifierTable has all the
        application codes supported by this interface. "
 ::= { optIfOChSsRsConfigEntry 2 }

optIfOChCfgApplicationIdentifierType OBJECT-TYPE
    SYNTAX Unsigned32
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "This parameter indicates the transceiver type of
        application code at Ss and Rs as defined in [ITU.G874.1],
        that is used by this interface.
        The optIfOChSrcApplicationIdentifierTable has all the
        application codes supported by this interface
        Standard = 0, PROPRIETARY = 1. "
 ::= { optIfOChSsRsConfigEntry 3 }

optIfOChCfgApplicationIdentifierLenght OBJECT-TYPE
    SYNTAX Unsigned32
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "This parameter indicates the number of octets in the
        Application Identifier.
        "
 ::= { optIfOChSsRsConfigEntry 4 }

optIfOChCfgApplicationIdentifier 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 used by this interface. The
        optIfOChSrcApplicationCodeTable has all the application
        codes supported by this interface.
        If the optIfOChCfgApplicationIdentifierType is 1
        (Proprietary), then the first 6 octets of the printable
        string will be the OUI (organizationally unique identifier)
        assigned to the vendor whose implementation generated the
        Application Identifier."
 ::= { optIfOChSsRsConfigEntry 5 }

optIfOChNumberApplicationIdentifiersSupported OBJECT-TYPE
```

```

SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    " Number of Application codes supported by this interface."
 ::= { optIfOChSsRsConfigEntry 6 }

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

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

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

OptIfOChSrcApplicationIdentifierEntry ::=
    SEQUENCE {
        optIfOChApplicationIdentifierNumber      Integer32,
        optIfOChApplicationIdentifierType         Integer32,
        optIfOChApplicationIdentifierLength       Integer32,
        optIfOChApplicationIdentifier             DisplayString
    }

optIfOChApplicationIdentifierNumber 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.
        "
    ::= { optIfOChSrcApplicationIdentifierEntry 1}

```

```
optIfOChApplicationIdentifierType OBJECT-TYPE
    SYNTAX Integer32 (1..255)
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " The type of identifier of the application code supported at
          this interface. The interface can support more than one
          application codes.
          Standard = 0, PROPRIETARY = 1
        "
    ::= { optIfOChSrcApplicationIdentifierEntry 2}

optIfOChApplicationIdentifierLength OBJECT-TYPE
    SYNTAX Integer32 (1..255)
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " This parameter indicates the number of octets in the
          Application Identifier.
        "
    ::= { optIfOChSrcApplicationIdentifierEntry 3}

optIfOChApplicationIdentifier OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        " The application code supported by this interface DWDM
          link.
          If the optIfOChApplicationIdentifierType is 1 (Proprietary),
          then the first 6 octets of the printable string will be
          the OUI (organizationally unique identifier) assigned to
          the vendor whose implementation generated the Application
          Identifier."
    ::= { optIfOChSrcApplicationIdentifierEntry 4}

-- Notifications

-- Central Frequency Change Notification
optIfOChCentralFrequencyChange NOTIFICATION-TYPE
    OBJECTS { optIfOChCentralFrequency }
    STATUS current
    DESCRIPTION
        "Notification of a change in the central frequency."
```



```
::= { 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
Sedona System
ISRAEL
email orig@sedonasys.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, February 2012.
- [ITU.G872]
International Telecommunications Union, "Architecture of optical transport networks", ITU-T Recommendation G.872 and Amd.1, October 2012.
- [ITU.G798]
International Telecommunications Union, "Characteristics of optical transport network hierarchy equipment functional blocks", ITU-T Recommendation G.798 and Amd.1, December 2012.

- [ITU.G874]
International Telecommunications Union, "Management aspects of optical transport network elements", ITU-T Recommendation G.874, August 2013.
- [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, October 2012.
- [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, February 2012.
- [ITU.G7710]
International Telecommunications Union, "Common equipment management function requirements", ITU-T Recommendation G.7710, February 2012.

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 Santa Maria Molgora, 48 c
20871 - Vimercate
Italy

Phone: +390392091462
Email: ggalimbe@cisco.com

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

Phone: +49xxxxxxxxxxx
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

Luyuan Fang (editor)
Microsoft
5600 148th Ave NE
Redmond, WA 98502
USA

Email: lufang@microsoft.com

Gary Ratterree (editor)
Microsoft
5600 148th Ave NE
Redmond, WA 98502
USA

Email: gratt@microsoft.com