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A YANG model to manage the optical interface parameters of "G.698.2 single channel" in DWDM applications draft-dharini-netmod-g-698-2-yang-02

Abstract

This memo defines a yang model that translates the SNMP mib module defined in draft-galikunze-ccamp-g-698-2-snmp-mib for managing single channel optical interface parameters of DWDM applications, using the approach specified in G.698.2. This model is 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 Yang model 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.

Status of This Memo

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

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This Internet-Draft will expire on May 14, 2015.

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1. Introduction

This memo defines a yang model that translates the SNMP mib module defined in draft-galikunze-ccamp-g-698-2-snmp-mib for managing single channel optical interface parameters of DWDM applications, using the

approach specified in G.698.2. This model is 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 the draft-kunze-g-698-2-management-control-framework

The building of a yang model describing the optical parameters defined in G.698.2 [ITU.G698.2], and reflected in G.874.1

[ITU.G874.1], 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 Yang Model, 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], which draft-galikunze-ccamp-g-698-2-snmp-mib is extending, 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].

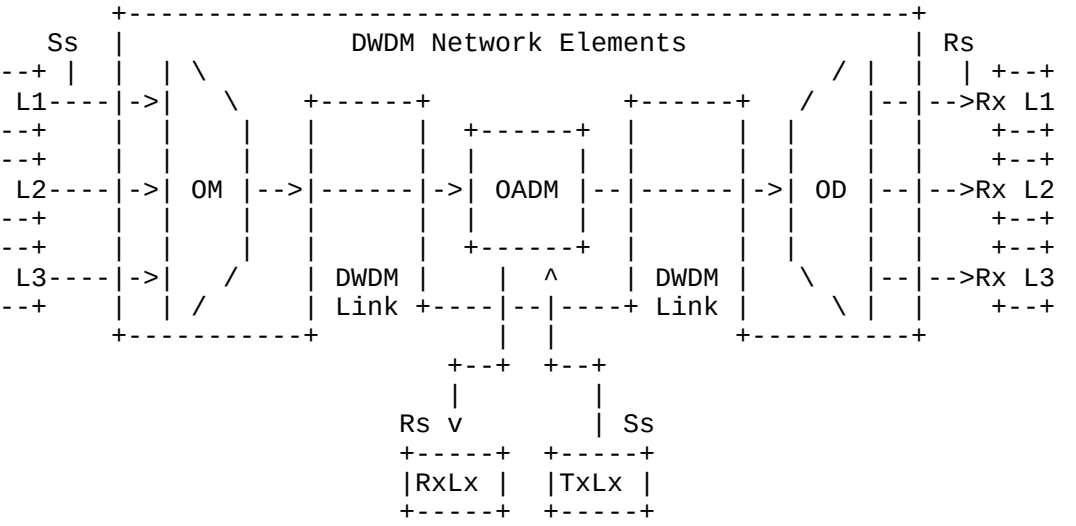
This memo specifies a Yang model for optical interfaces.

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 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. 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 (R) the parameter can be retrieve with a read, when (W) it can be provisioned by a write, (R,W) can be either read or written.

4.1.1. 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). See the details in 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 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.698.2)

4.2. Optical Interface for G.698.2

The ietf-opt-if-g698-2 is an augment to the ietf-interface. It allows the user to set the application code/vendor transceiver class/ wavelength and the output power. The module can also be used to get the list of supported application codes/ transceiver class and also the wavelength/output power/input power of the interface.

```
      module: ietf-opt-if-g698-2
      augment /if:interfaces/if:interface:
          +--rw optIfOChRsSs
                +--rw ifCurrentApplicationCode
                |  +--rw applicationCodeId?   uint8
                |  +--rw applicationCode?     string
                +--rw ifCurrentVendorTransceiverClass
                |  +--rw vendorTransceiverClassId?   uint8
                |  +--rw vendorTransceiverClass?     string
                +--ro ifSupportedApplicationCodes
                |  +--ro numberApplicationCodesSupported?   uint32
                |  +--ro applicationCodesList* [applicationCodeId]
                |     +--ro applicationCodeId   uint8
                |     +--ro applicationCode?    string
                +--ro ifSupportedVendorTransceiverClass
                |  +--ro numberVendorTransceiverClassSupported?   uint32
                |  +--ro vendorTransceiverClassList*
                                              [vendorTransceiverClassId]
                |     +--ro vendorTransceiverClassId   uint8
                |     +--ro vendorTransceiverClass?    string
                +--rw outputPower?                     int32
                +--ro inputPower?                      int32
                +--rw wavelengthn?                     uint32


       notifications:
      +---n optIfOChWavelengthChange
      |  +--ro if-name?      leafref
      |  +--ro wavelength
      |     +--ro wavelength?   uint32
      +---n optIfOChApplicationCodeChange
      |  +--ro if-name?              leafref
      |  +--ro newApplicationCode
      |     +--ro applicationCodeId?   uint8
      |     +--ro applicationCode?     string
      +---n optIfOChVendorTransceiverCodeChange
         +--ro if-name?                     leafref
         +--ro newVendorTransceiverClass
            +--ro vendorTransceiverClassId?   uint8
            +--ro vendorTransceiverClass?     string
```

5. Structure of the Yang Module

ietf-opt-if-g698-2 is a top level model for the support of this feature.

6. Yang Module

The ietf-opt-if-g698-2 is defined as an extension to ietf interfaces.

<CODE BEGINS> file "ietf-opt-if-g698-2.yang"

```
module ietf-opt-if-g698-2 {
     namespace "urn:ietf:params:xml:ns:yang:ietf-opt-if";
     prefix ietf-opt-if-g698-2;

     import ietf-interfaces {
       prefix if;
     }

     organization
       "IETF NETMOD (NETCONF Data Modelling Language) Working Group";

     contact
       "WG Web:   <http://tools.ietf.org/wg/netmod/>
        WG List:  <mailto:netmod@ietf.org>

        WG Chair: Thomas Nadeau
                  <mailto:tnadeau@lucidvision.com>

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        Editor:   Dharini Hiremagalur
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     description
       "This module contains a collection of YANG definitions for
        configuring Optical interfaces.

        Copyright (c) 2013 IETF Trust and the persons identified as
        authors of the code.  All rights reserved.

        Redistribution and use in source and binary forms, with or
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        to the license terms contained in, the Simplified BSD License
        set forth in Section 4.c of the IETF Trust's Legal Provisions
        Relating to IETF Documents
        (http://trustee.ietf.org/license-info).";

        revision 2014-5-10 {
           description
               "Initial revision.";
```

```
            reference
                "RFC XXXX: A YANG Data Model for Optical Management of
                  an Interface for g.698.2 support";
         }
         revision 2014-10-14 {
            description
               "Revision 1.0";
         }
         revision 2014-11-10{
            description
               "Revision 2.0";
         }
```

```
      grouping optIfOChVendorTransceiverClass {
          description "A unique Vendor transceiver class supported by
                       this interface";
          leaf vendorTransceiverClassId {
                   description
                       "Id for the Vendor transceiver class";
                   type uint8 {
                       range "1..255";
                   }
          }
          leaf vendorTransceiverClass {
              type string {
                   length "1..256";
              }
              description "This defines the transceiver class that
                      is/should be used by this interface.
                      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).";
            }

      }

      grouping optIfOChVendorTransceiverClassList {
          description "List of vendor transceiver codes group.";
          leaf numberVendorTransceiverClassSupported {
              type uint32;
              description "Number of Vendor classes supported by this
                           interface";
          }
          list vendorTransceiverClassList {
              key "vendorTransceiverClassId";
              uses optIfOChVendorTransceiverClass;
          }
       }




      grouping optIfOChApplicationCode  {
             description "Application code entity.";
             leaf applicationCodeId {
                  description
                      "Id for the Application code";
```

```
                type uint8 {
                    range "1..255";
                }
            }
            leaf applicationCode {
                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 optIfOChApplicationsCodeList has all the
                   application codes supported by this interface.";
                type string {
                    length "1..256";
                }
            }
     }


     grouping optIfOChApplicationCodeList {
         description "List of Application codes group.";
         leaf numberApplicationCodesSupported {
             type uint32;
             description "Number of Application codes supported by
                          this interface";
         }
         list applicationCodeList {
             key "applicationCodeId";
             uses optIfOChApplicationCode;
         }
     }


    grouping optIfOChPower {
        leaf outputPower {
           type int32;
           units ".01dbm";
           description "The output power for this interface in .01
                        dbm.";
        }

        leaf inputPower {
            type int32;
            config false;
            units ".01dbm";
            description "The current input power of this interface";
         }
    }
```

```
     grouping optIfOChWavelength {
          leaf wavelengthn {
              type uint32;
              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* Channel Spacing
                                                 (converted to nm)
              Eg - Channel Spacing in nm
              'Wavelength (nm ) = 1471nm + n* 20nm  (20nm is the
               spacing for CWDM)' ";

            }
     }

      notification optIfOChWavelengthChange {
         description "A change of wavelength has been detected.";
         leaf "if-name" {
             type leafref {
                 path "/if:interfaces/if:interface/if:name";
             }
         }
         container wavelength {
             uses optIfOChWavelength;
         }
      }

      notification optIfOChApplicationCodeChange {
         description "A change of Application code has been detected.";
         leaf "if-name" {
             type leafref {
                 path "/if:interfaces/if:interface/if:name";
             }
         }
         container newApplicationCode {
             uses optIfOChApplicationCode;
         }
      }


      notification optIfOChVendorTransceiverCodeChange {
         description "A change of vendor transceiver code has been
                      detected.";
         leaf "if-name" {
             type leafref {
                 path "/if:interfaces/if:interface/if:name";
             }
         }
```

```
         container newVendorTransceiverClass {
            uses optIfOChVendorTransceiverClass;
          }
       }

       augment "/if:interfaces/if:interface" {

          container optIfOChRsSs {
            description "RsSs path configuration for an interface";

             container ifCurrentApplicationCode {
                uses optIfOChApplicationCode;
             }

             container ifCurrentVendorTransceiverClass {
                 uses optIfOChVendorTransceiverClass;
             }

             container ifSupportedApplicationCodes {
                 config false;
                 uses optIfOChApplicationCodeList;
             }

             container ifSupportedVendorTransceiverClass {
                 config false;
                 uses optIfOChVendorTransceiverClassList;
             }

             uses optIfOChPower;

             uses optIfOChWavelength;

          }
       }
}

<CODE ENDS>
```

7. Security Considerations

The YANG module defined in this memo is designed to be accessed via the NETCONF protocol [RFC6241]. he lowest NETCONF layer is the secure transport layer and the mandatory-to-implement secure transport is SSH [RFC6242]. The NETCONF access control model [RFC6536] provides the means to restrict access for particular NETCONF users to a pre-configured subset of all available NETCONF protocol operation and content.

8. IANA Considerations

This document registers a URI in the IETF XML registry [RFC3688]. Following the format in [RFC3688], the following registration is requested to be made:

URI: urn:ietf:params:xml:ns:yang:ietf-interfaces:ietf-opt-if-g698-2

Registrant Contact: The IESG.

XML: N/A, the requested URI is an XML namespace.

This document registers a YANG module in the YANG Module Names registry [RFC6020].

This document registers a YANG module in the YANG Module Names registry [RFC6020].

prefix: ietf-opt-if-g698-2 reference: RFC XXXX

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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.

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