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A YANG model to manage t optical interface parameters of DWDM applications
draft-dharini-netmod-g-698-2-yang-00

Abstract

This memo defines a yang model for managing Optical parameters associated with Dense Wavelength Division Multiplexing (DWDM) interfaces. This is to support the optical parameters described in ITU-T G.698.2. [ITU.G698.2]

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

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 January 2, 2015.

Table of Contents

1. Introduction

This memo 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 the draft-kunze-g-698-2-management-control-framework

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.

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.

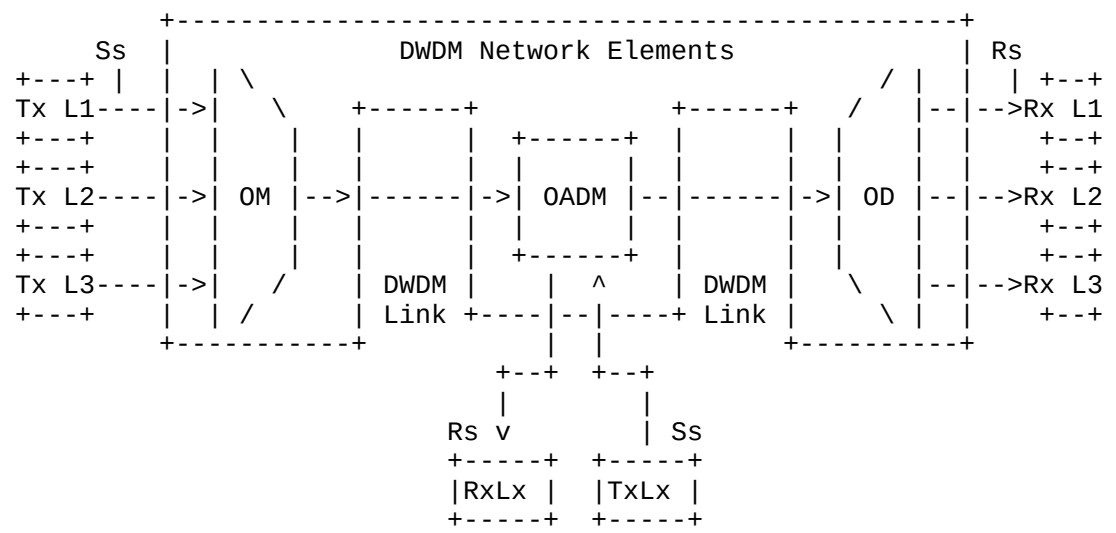
3. Conventions

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

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.

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/vedor 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 /ietf-interfaces
   +.... rw optIfOChRsSs
      +... rw ifCurrentApplicationCode
      |     + .... rw  applicationCodeId
      |     + .... rw  applicationCode
      +... rw ifCurrentVendorTransceiverClass
      |     + .... rw  vendorTransceiverClassId
      |     + .... rw  vendorTransceiverClass
      +... r  ifSupportedApplicationCodes
      |     + .... r  numberApplicationCodesSupported
      |     + .... r  optIfOChApplicationCodesList * [application
                                                        CodeId]
      |          | + .... r  applicationCodeId
      |          | + .... r  applicationCode
      +... r  ifSupportedVendorTransceiverClasses
      |     + .... r  numberTransceiverClassesSupported
      |     + .... r  optIfOChVendorTransceiverClassList * [vendor
                                                  TransceiverClassId]
      |          | + .... r  VendorTransceiverClassId
      |          | + .... r  VendorTransceiverClass
      +... rw  wavelengthn
      +... rw  outputPower
      +... r   InputPower
```

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.

```
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;
     }

     import ietf-yang-types {
       prefix yang;
     }
     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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                  <mailto:j.schoenwaelder@jacobs-university.de>

        Editor:   Dharini Hiremagalur
                  <mailto:dharinih@juniper.net>";

     description
       "This module contains a collection of YANG definitions for
        configuring Optical interfaces.

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        authors of the code.  All rights reserved.

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        Relating to IETF Documents
        (http://trustee.ietf.org/license-info).

        revision 2014-05-10 {
```

```
            description
                "Initial revision.";
            reference
                "RFC XXXX: A YANG Data Model for Optical Management of
                  an Interface for g.698.2 support";
         }



    grouping optIfOCh-VendorTransceiverClass {
        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 optIfOChVendorTransceiverClassesList {
        leaf numberVendorClassesSupported {
            type uint32;
            description " Number of Vendor classes supported by this
                          interface";
        }
        list vendorTransceiverList {
            key "vendorTransceiverId";
            uses optIfOCh-VendorTransceiverClass;

           }
        }
    }
```

```
      grouping optIfOChApplicationCode  {
             leaf applicationCodeId {
                  description
                      " Id for the Application code";
                  type uint8 {
                      range "1..255";
                  }
              }
              leaf applicationCode {
                  type string {
                      length "1..256";
                  }
                  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. ";
                  }
              }
      }

      grouping optIfOChApplicationCodesList {
          leaf numberApplicationCodesSupported {
              type uint32;
              description " Number of Application codes supported by
                            this interface";
          }
          list applicationCodeList {
              key "applicationCodeId";
              uses   optIfApplicationCode;
          }
      }

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

      grouping optIfOChInputPower {
          description " Input power of this interface ";
          leaf inputPower {
              type int32;
              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 {
         leaf "if-name" {
             type leafref {
                 path "/interface/name";
             }
         }
         container wavelength {
             uses optIfOChWavelength;
         }
      }

      notification optIfOChApplicationCodeChange {
         leaf "if-name" {
             type leafref {
                 path "/interface/name";
             }
         }
         container newApplicationCode {
             uses optIfApplicationCode;
         }
      }

      notification optIfOChVendorTransceiverCodeChange {
         leaf "if-name" {
             type leafref {
                 path "/interface/name";
             }
         }
         container newVendorTransceiverClass {
```

```
             uses optIfVendorTransceiverClass;
          }
       }

       augment "/ietf-interfaces" {

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

             container ifCurrentApplicationCode {
                uses optIfOChApplicationCode;
             }

             container ifCurrentVendorTransceiverClass {
                 uses optIfOChVendorTransceiverClasses;
             }

             container ifSupportedApplicationCodes {
                 uses optIfOChApplicationCodesList;
             }

             container ifSupportedVendorTransceiverClasses {
                 uses optIfOChVendorTransceiverClassesList;
             }

             uses optIfOChOutputPower;

             uses optIfOChWavelength;

             uses optIfOChInputPower;

          }
       }
 }
```

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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10. References

10.1. 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.

10.2. 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.

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