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# Extension to the Link Management Protocol (LMP/DWDM -rfc4209) for Dense Wavelength Division Multiplexing (DWDM) Optical Line Systems to manage black-link optical interface parameters of DWDM application

draft-dharinigert-ccamp-g-698-2-lmp-02

## Abstract

This memo defines extensions to LMP(rfc4209) for managing Optical parameters associated with Wavelength Division Multiplexing (WDM) systems or characterized by the Optical Transport Network (OTN) in accordance with the Black-Link approach defined in ITU-T Recommendation G.698.2.[ITU.G698.2], G.694.1.[ITU.G694.1] and its extendsions./>



## 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 August 25, 2013.

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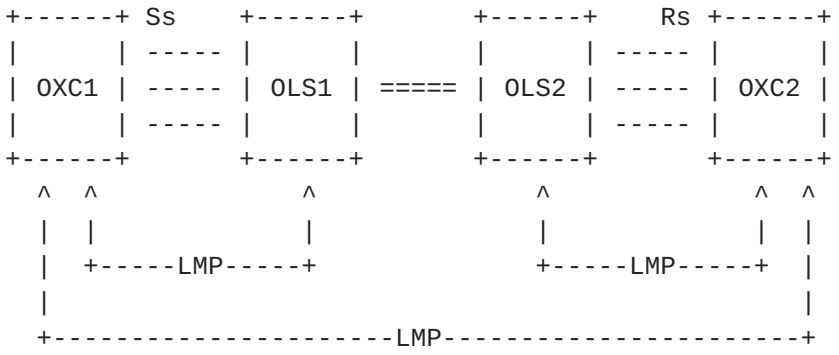
## 1. Introduction

This extension is based on "draft-galikunze-ccamp-g-698-2-snmp-mib-02" and "draft-kunze-g-698-2-management-control-framework-02", for the relevant optical parameters mainly (but not restrictriced to) described in recommendations like ITU-T G.698.2 [ITU.G698.2]. The LMP Model from RFC4902 is extended to provide link property correlation between a client and an OLS device. By using LMP, the capabilities of either end of this link are exchanged where the term 'link' refers to the attachment link between OXC and OLS (see Figure 1). By performing link property correlation, both ends of the link can agree on a common parameter window that can be supported and supervised by each device. The actual selection of a specific parameter value whithin the parameter window is outside the scope of LMP. In GMPLS the parameter selection (e.g. wavelength) is performed by RSVP-TE and Wavelength routing by IGP.

Figure 1 Extended LMP Model ( from [RFC4209] )




OXC : is an entity that contains transponders
OLS : generic optical system, it can be - Optical mux, Optical demux, Optical Add Drop Mux, etc
OLS to OLS : represents the black-Link itself
Rs/Ss : inbetween the OXC and the OLS

Figure 1: Extended LMP Model

## 2. Extensions to LMP-WDM Protocol

This document defines extensions to [RFC4209] to allow the Black Link (BL) parameters of G.698.2, as described in the draft

draft-kunze-g-698-2-management-control-framework-02, to be exchanged between a router or optical switch and the optical line system to which it is attached. In particular, this document defines additional Data Link sub-objects to be carried in the LinkSummary message defined in [RFC4204] and [RFC6205]. The OXC and OLS systems may be managed by different Network management systems and hence may not know the capability and status of their peer. The intent of this draft is to enable the OXC and OLS systems to exchange this information. These messages and their usage are defined in subsequent sections of this document.

The following new messages are defined for the WDM extension for ITU-T G.698.2 [ITU.G698.2]/ITU-T G.698.1 [ITU.G698.1]/ ITU-T G.959.1 [ITU.G959.1]

- BL_General (sub-object Type = TBA)
- BL_ApplicationCode (sub-object Type = TBA)
- BL_Ss (sub-object Type = TBA)
- BL_SsRs (sub-object Type = TBA)
- BL_Rs (sub-object Type = TBA)
- BL_OLS_Status (sub-object Type = TBA)

## 3. Black Link General Parameters - BL_General

These are the general parameters as described in [G698.2] and [G.694.1]. Please refer to the "draft-galikunze-ccamp-g-698-2-snmp-mib-02" for more details about these parameters and the [RFC6205] for the wavelength definition.

The general parameters are

1. Bit-Rate/line coding of optical tributary signals
2. Wavelength - (Tera Hertz) 4 bytes (see RFC6205 sec.3.2 and 3.3 TLV): Grid / Cannel Spacing / Identifier / n
3. Min Wavelength Range - (Tera Hertz) 4 bytes (see RFC6205 sec.3.2 and 3.3 TLV): Grid/Cannel Spacing/Identifier/n
4 Max Wavelength Range - (Tera Hertz) 4 bytes (see RFC6205 sec.3.2 and 3.3 TLV): Grid/Cannel Spacing/Identifier/n
5. BER mantisa - 4 bytes
6. BER exponent - 4 bytes
7. FEC Coding - 1 byte
8. Administrative state - 1 byte
9. Operation state - 1 byte

Figure 2: The format of the this sub-object (Type = TBA, Length = TBA) is as follows:

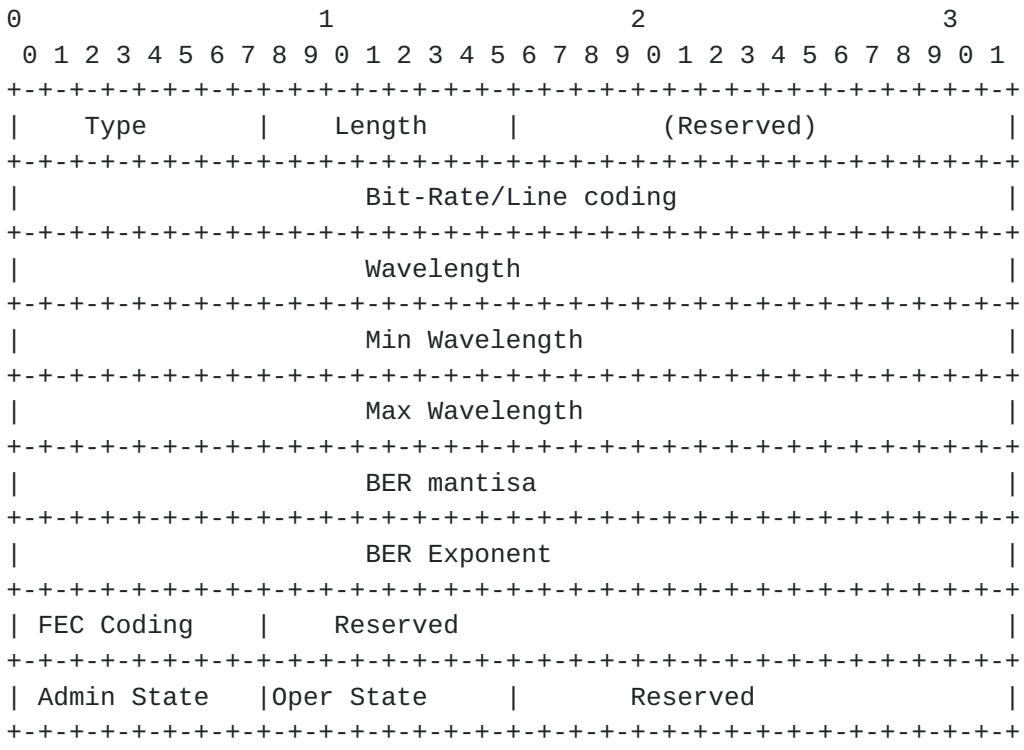



Figure 2: BL_General

## 4. Black Link ApplicationCode - BL_ApplicationCode

These are the general parameters as described in [G698.2]. Please refer to the "draft-galikunze-ccamp-g-698-2-snmp-mib-02". for more details about these parameters.

The general parameters are

1. Single-channel application codes -- 32 bytes
   (from [G698.1]/[G698.2]/[G959.1]
2. Vendor Transceiver Class -- 32 bytes
   When Single-channel application code (which is defined in G.698.2) is used in the message, then the vendor transaction class need not be used (i.e. all 0) and the optional parameters except nominal central frequency need not be used. When vendor transaction class is used in the message, then the Single-channel application code need not be used (i.e. all 0) and the optional parameters needs to be used.

Figure 3: The format of the this sub-object (Type = TBA, Length = TBA) is as follows:

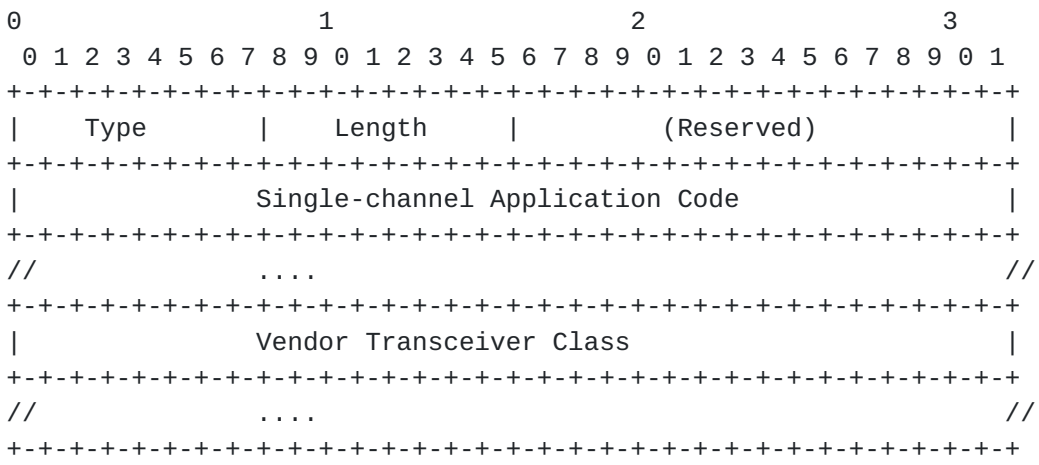



Figure 3: BL_ApplicationCode

## 5. Black Link - BL_Ss

These are the G.698.2 parameters at the Source(Ss reference points). Please refer to "draft-galikunze-ccamp-g-698-2-snmp-mib-02" for more details about these parameters.

1. Minimum Mean Channel Output Power -(0.1 dbm) 4 bytes
2. Maximum Mean Channel Output Power -(0.1 dbm) 4 bytes
3. Minimum Central Frequency - (THz) 4 bytes (see RFC6205 sec.3.2 and 3.3 TLV): Grid / Cannel Spacing / Identifier / n
4. Maximum Central Frequency - (THz) 4 bytes (see RFC6205 sec.3.2 and 3.3 TLV): Grid / Cannel Spacing / Identifier / n
5. Maximum Spectral Excursion - (0.1 GHz) 4 bytes
6. Maximum Tx Dispersion OSNR Penalty - (0.1 dbm) 4 bytes
7. Current Output Power - (0.1dbm) 4 bytes
8. Status of TX - Status of the Transmit link at OXC - 4 bytes

Figure 4: The format of the Black link sub-object (Type = TBA, Length = TBA) is as follows:

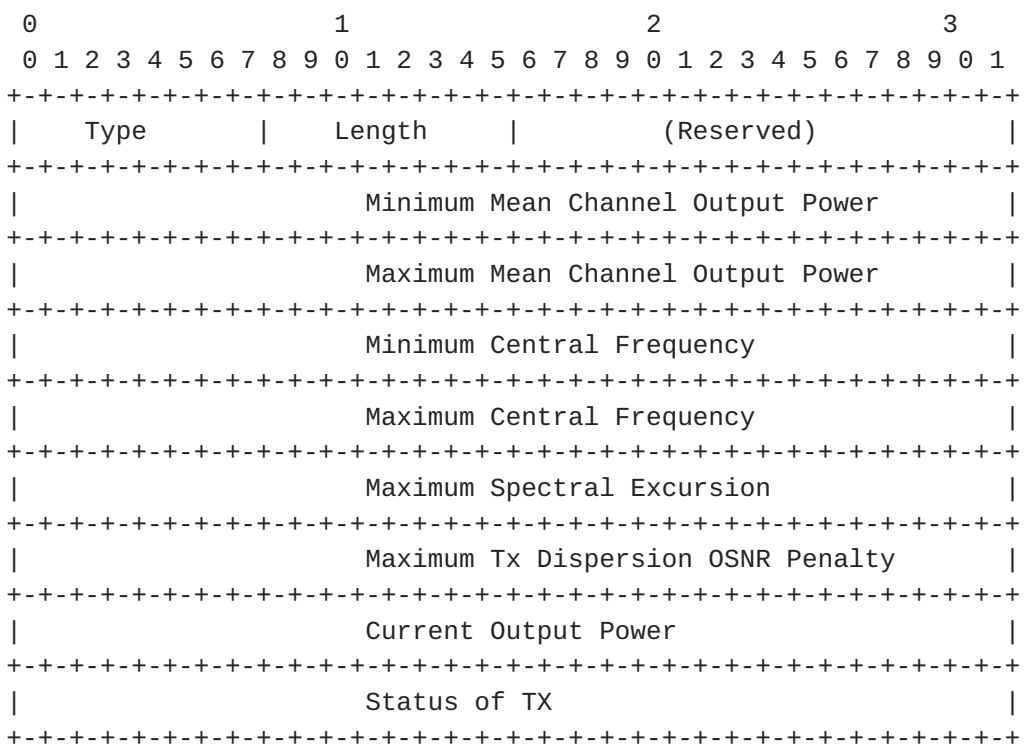



Figure 4: Black Link - BL_Ss

## 6. Black Link - BL_SsRs

These are the G.698.2 parameters for the path (Ss-Rs). Please refer to the "draft-galikunze-ccamp-g-698-2-snmp-mib-02" for more details about these parameters.

1 Minimum Chromatic Dispersion - (ps/nm) 4 bytes
2. Maximum Chromatic Dispersion -(ps/nm) 4 bytes
3. Minimum Src Optical ReturnLoss -(0.1 db) 4 bytes
4. Maximum Discrete Reflectance Src To Sink - (0.1 db) 4 bytes
5. Maximum Differential Group Delay - (ps) 4 bytes
6. Maximum Polarisation Dependent Loss - (0.1 db) 4 bytes
7. Maximum Inter Channel Crosstalk - (0.1 db) 4 bytes
8. Interferometric Crosstalk - (0.1 db) 4 bytes
9. Optical Path OSNR Penalty - (0.1 db) 4 bytes
10. Fiber type - 1 byte

Figure 5: The format of the Black link sub-object (Type = TBA, Length = TBA) is as follows:

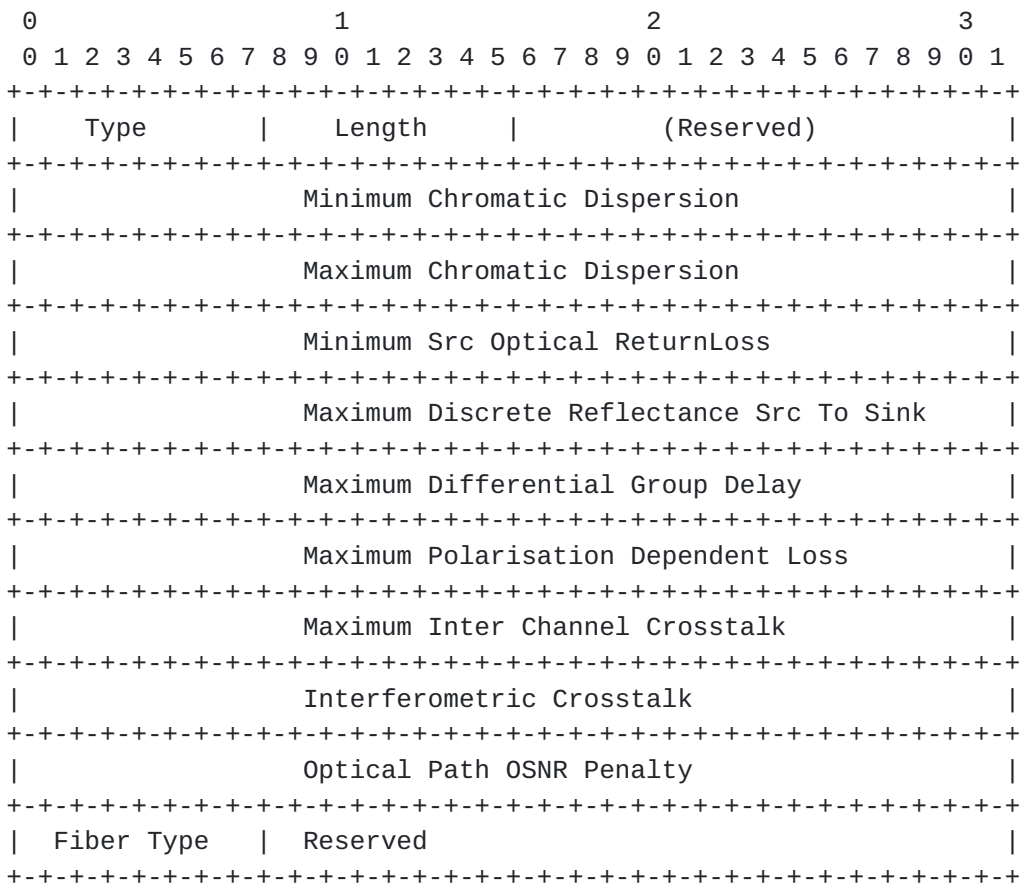



Figure 5: Black Link - BL_SsRs

## 7. Black Link - BL_Rs

These are the G.698.2 parameters at the Sink (Rs reference points). Please refer to the "draft-galikunze-ccamp-g-698-2-snmp-mib-02" for more details about these parameters.

1. Minimum Mean Input Power - (0.1dbm) 4bytes
2. Maximum Mean Input Power - (0.1dbm) 4bytes
3. Minimum OSNR - (0.1dB) 4bytes
4. OSNR Tolerance - (0.1dB) 4bytes
5. Current Input Power at the OXC - (0.1dbm) 4bytes
6. Threshold of the input power at OLS - The power level above which the OLS will not function (0.1dbm) 4bytes
7. Current Optical OSNR (0.1dB)
8 Q factor
9. Post FEC BER Mantissa
10. Post FEC BER Exponent
11. Status of RX - Status of the Receive link at OXC - 2bytes

Figure 6: The format of the Black link sub-object (Type = TBA, Length = TBA) is as follows:

The format of the Black Link/OLS Sink sub-object (Type = TBA, Length = TBA) is as follows:

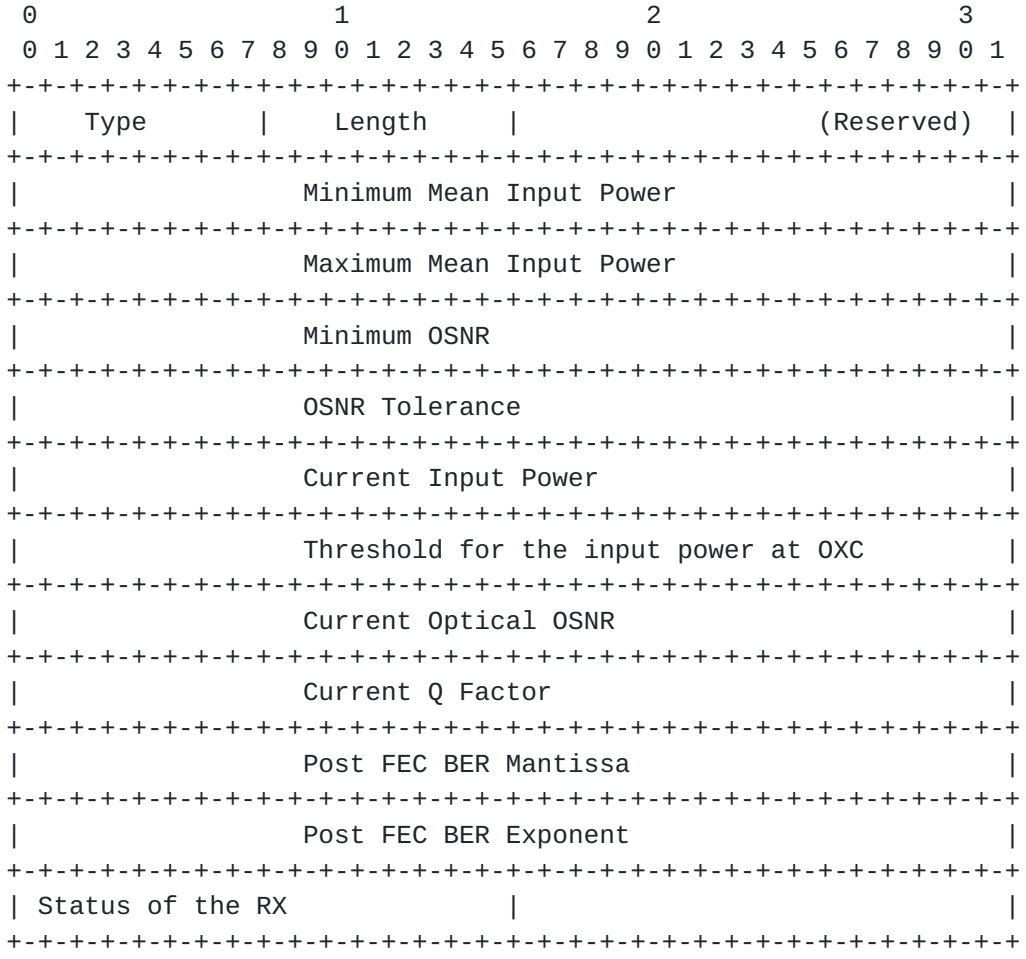



Figure 6: Black Link - BL_Rs

## 8. Black Link - OLS_Status

This message is sent by the OLS to the OXC. It includes the wavlength information and the status of the OLS.

1. Wavelength - The wavelength which has been accepted by the OLS (Tera Hertz) 4 bytes. (see RFC6205
   sec.3.2 and 3.3 TLV): Grid / Cannel Spacing / Identifier / n
2. Length of the Wavelength Availability Map 1 byte
3. Wavelenth Availability bits - variable bits depending on the nunmer of wavelengths available (For eg 96 bits for C-band 50GHz) (Allocation is in multiples of 1byte - 96 bits - 12 bytes)
   0 - wavelength is available, 1 - used - variable length
4. Current Input Power (0.1dbm) 4 bytes
   - This is the current input power at OLS
5. Delta between output power at the Src(OXC)and Input Power at OLS (0.1dbm) 4 bytes
   - This is the delta between the input power and the transmitted output power at the OXC (from message 2.2 BL_Src)
6. Threshold of the input power at OLS 4 bytes
   - This is the power level above which the OLS will not function.
7. Current Output Power (0.1dbm) 4 bytes
   - This is the transmitted output power at the OLS.
8. Status of Rx link at OLS 2 bytes
   - Status of the Receive link at the OLS
9. Status of Tx link at OLS 2 bytes
   - Status of the Transmit link at the OLS

Figure 7: The format of the Black link sub-object (Type = TBA, Length = TBA) is as follows:

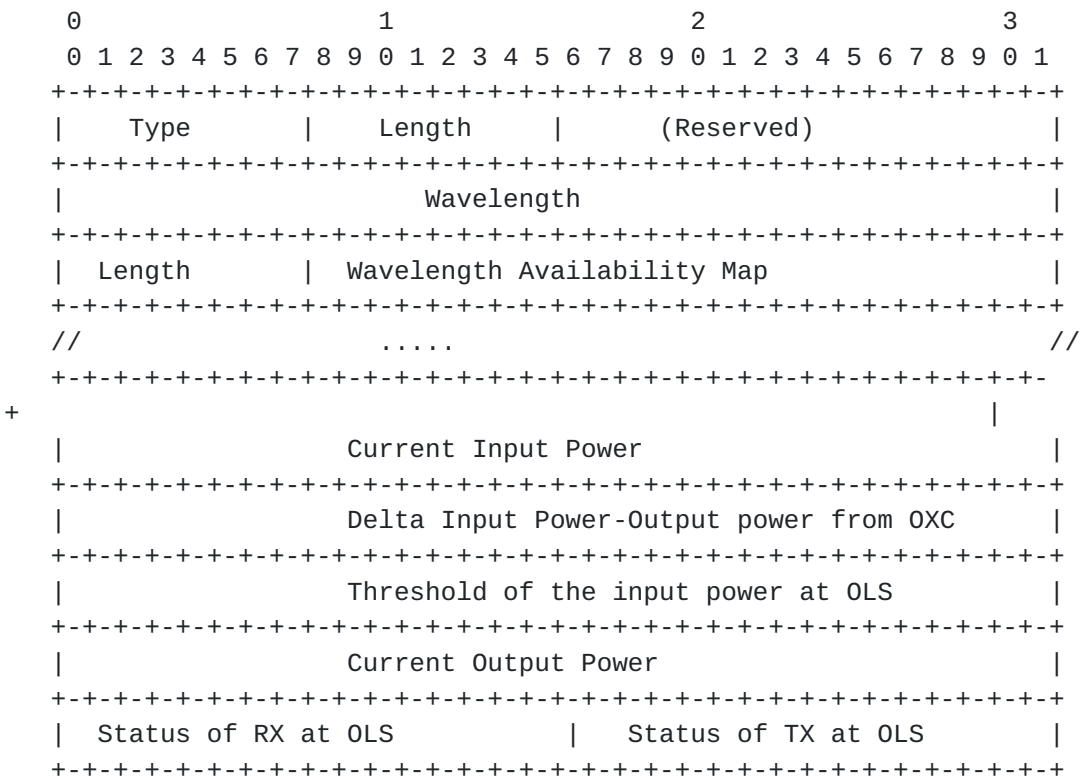



Figure 7: Black Link - OLS_Status

## 9. Security Considerations

LMP message security uses IPsec, as described in [RFC4204]. This document only defines new LMP objects that are carried in existing LMP messages, similar to the LMP objects in [RFC:4209]. This document does not introduce new security considerations.

## 10. IANA Considerations

LMP [RFC4204] defines the following name spaces and the ways in which IANA can make assignments to these namespaces: - LMP Message Type - LMP Object Class - LMP Object Class type (C-Type) unique within the Object Class - LMP Sub-object Class type (Type) unique within the Object Class This memo introduces the following new assignments: LMP Sub-Object Class names: under DATA_LINK Class name (as defined in [RFC4204]) - BL_General (sub-object Type = TBA) - BL_Applicationcode (sub-object Type = TBA) - BL_Ss (sub-object Type = TBA) - BL_SsRs (sub-object Type = TBA) - BL_Rs (sub-object Type = TBA) - OLS_Status

(sub-object Type = TBA)

## 11. References

### 11.1. Normative References

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International Telecommunications Union, "Architecture of optical transport networks", ITU-T Recommendation G.872, November 2001.

### 11.2. Informative References

[I-D.kunze-g-698-2-management-control-framework]
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[I-D.galimbe-kunze-g-698-2-snmp-mib]
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