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Extension to the Link Management Protocol (LMP/DWDM -rfc4209) for Dense
 Wavelength Division Multiplexing (DWDM) Optical Line Systems to manage
   application code of optical interface parameters in DWDM application
                  draft-dharinigert-ccamp-g-698-2-lmp-06

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 Interface Application Code 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

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

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1. Introduction

   This extension is based on "draft-galikunze-ccamp-g-698-2-snmp-
   mib-03" and "draft-kunze-g-698-2-management-control-framework-02",
   for the relevant interface optical parameters 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.
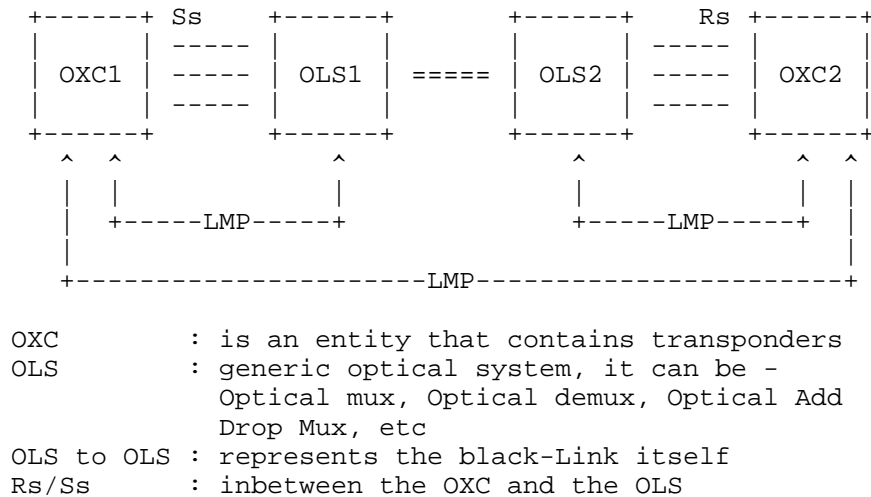
Figure 1 Extended LMP Model (from [RFC4209])

```
        +------+ Ss    +------+        +------+   Rs +------+
        |      | -----  |      |        |      | ----- |      |
        | OXC1 | -----  | OLS1 | ====== | OLS2 | ----- | OXC2 |
        |      | -----  |      |        |      | ----- |      |
        +------+        +------+        +------+        +------+
         ^  ^              ^               ^             ^  ^
         |  |              |               |             |  |
         |  +-----LMP-----+                +-----LMP-----+  |
         |                                                  |
         +--------------------LMP--------------------------+


        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_VendorTransceiverClass (sub-object Type = TBA)
      - BL_Ss   (sub-object Type = TBA)
      - BL_Rs   (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-04" 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)
         3. Number of Application Codes Supported
         4. Number of Vendor Transceiver Classes Supported
         5. Identifier of Application code to/in use
         6. Identifier Vendor transceiver Application code to/in use

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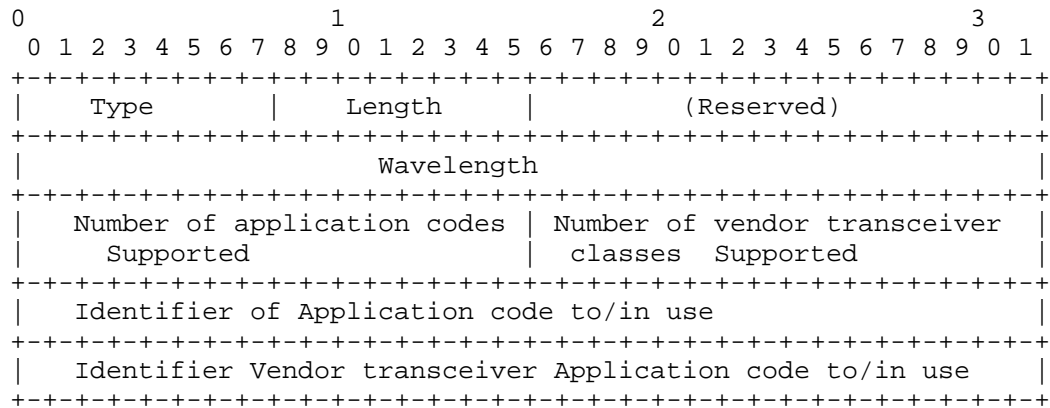   TBA) is as follows:

```
0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |    Length     |          (Reserved)           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                          Wavelength                           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Number of application codes | Number of vendor transceiver  |
|      Supported                |  classes  Supported           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Identifier of Application code to/in use                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Identifier Vendor transceiver Application code to/in use   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

                        Figure 2: BL_General

4. Black Link ApplicationCode - BL_ApplicationCode

   This message is to exchange the application code supported as
   described in [G698.2]. Please refer to the "draft-galikunze-
   ccamp-g-698-2-snmp-mib-04". for more details about these parameters.
   There can be more than one Application Code supported by the OXC/OLS.
   The number of application codes supported is exchanged in the
   "BL_General" message. (from [G698.1]/[G698.2]/[G959.1]

The parameters are
   1. Single-channel application code identifire - 8 bits

   2. Single-channel application codes -- 32 bytes
      (from [G698.1]/[G698.2]/[G959.1] - this parameter can have
      multiple instances as the transceiver can support multiple
      application codes.

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

```
0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |    Length     |         (Reserved)            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Single-channel|          (Reserved)                          |
|    Application|                                              |
| CodeIdentifier|                                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              Single-channel Application Code                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
//                 ....                                       //
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```


Figure 3: BL_ApplicationCode

5. Black Link Vendor Transceiver Class - BL_ApplicationCode

   This message is to exchange the application code supported as
   described in [G698.2]. Please refer to the "draft-galikunze-
   ccamp-g-698-2-snmp-mib-04". for more details about these parameters.
   There can be more than one Vendor Transceiver Class supported by the
   OXC/OLS. The number of Vendor Transceiver Classes supported is
   exchanged in the "BL_General" message. (from [G698.1]/[G698.2]/
   [G959.1]

The parameters are
   1. Single-channel Transceiver Class identifier - 8 bits

   2. Vendor Transceiver Class -- 32 bytes
      (from [G698.1]/[G698.2]/[G959.1] - this parameter can have
      multiple instances as the transceiver can support multiple
      application codes.

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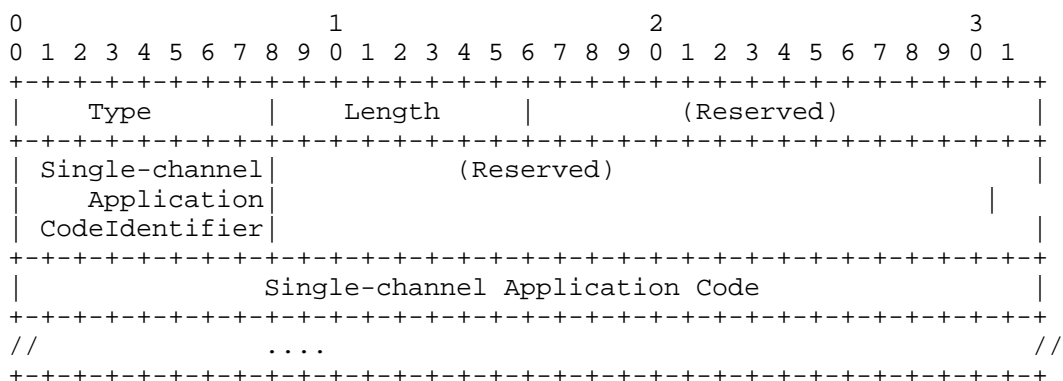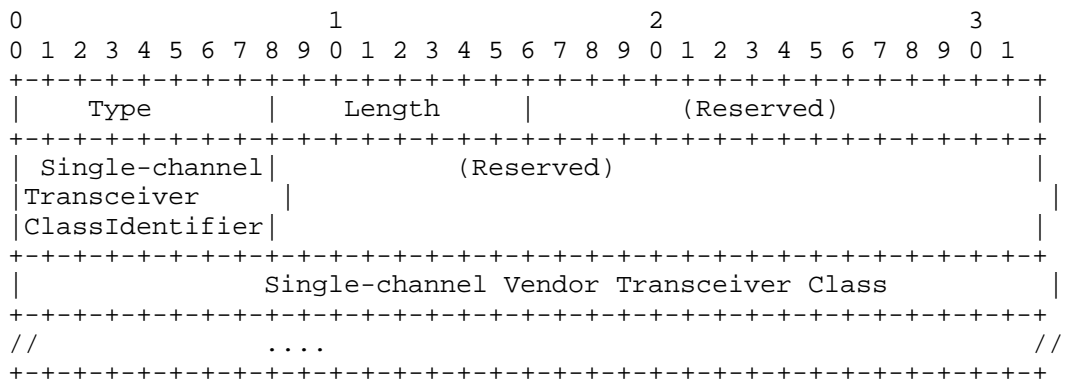TBA) is as follows:


```
0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |     Length    |           (Reserved)          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Single-channel|          (Reserved)                           |
|Transceiver    |                                               |
|ClassIdentifier|                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|               Single-channel Vendor Transceiver Class         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
//              ....                                            //
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```


Figure 4: BL_VendorTransceiverClass

6. 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-03" for more
   details about these parameters.

      1. Output power

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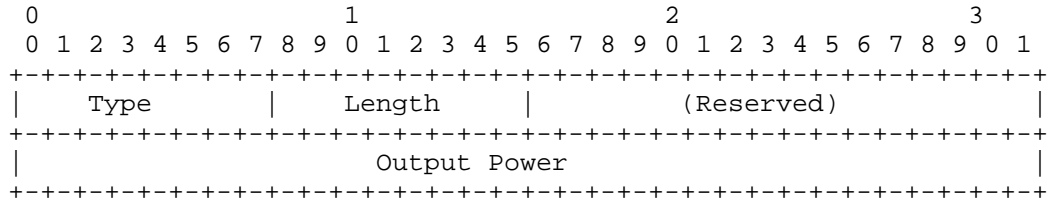   = TBA) is as follows:


```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |     Length     |            (Reserved)        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         Output Power                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```


                      Figure 5: Black Link - BL_Ss

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. Current Input Power   - (0.1dbm) 4bytes

   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,
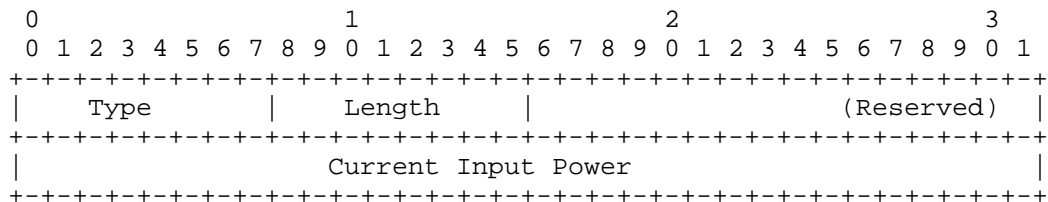   Length = TBA) is as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |     Length    |                   (Reserved)  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Current Input Power                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```


                      Figure 6: Black Link - BL_Rs

8. 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.

9. IANA Considerations

     LMP <xref target="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 <xref target="RFC4204"/>)
       - BL_General   (sub-object Type = TBA)
       - BL_ApplicationCode   (sub-object Type = TBA)
       - BL_VendorTransceiverClass (sub-object Type = TBA)
       - BL_Ss   (sub-object Type = TBA)
       - BL_Rs   (sub-object Type = TBA)

10. References

10.1. Normative References

   [RFC4204] Lang, J., "Link Management Protocol (LMP)", RFC 4204,
              October 2005.

   [RFC4209] Fredette, A. and J. Lang, "Link Management Protocol (LMP)
              for Dense Wavelength Division Multiplexing (DWDM) Optical
              Line Systems", RFC 4209, October 2005.

   [RFC6205] Otani, T. and D. Li, "Generalized Labels for Lambda-
              Switch-Capable (LSC) Label Switching Routers", RFC 6205,
              March 2011.

   [RFC4054] Strand, J. and A. Chiu, "Impairments and Other Constraints
              on Optical Layer Routing", RFC 4054, May 2005.

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              International Telecommunications Union, "Amplified
              multichannel dense wavelength division multiplexing
              applications with single channel optical interfaces",
              ITU-T Recommendation G.698.2, November 2009.

[ITU.G694.1]
          International Telecommunications Union, ""Spectral grids
          for WDM applications: DWDM frequency grid"", ITU-T
          Recommendation G.698.2, February 2012.

[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.

10.2. Informative References

[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.

[I-D.galimbe-kunze-g-698-2-snmp-mib]
          Kunze, R. and D. Hiremagalur, "A SNMP MIB to manage black-
          link optical interface parameters of DWDM applications",
          draft-galimbe-kunze-g-698-2-snmp-mib-02 (work in
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