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Extension to the Link Management Protocol (LMP/DWDM -rfc4209) for Dense  
Wavelength Division Multiplexing (DWDM) Optical Line Systems to manage  
the application code of optical interface parameters in DWDM application  
draft-dharinigert-ccamp-dwdm-if-lmp-05

## Abstract

This memo defines extensions to LMP(rfc4209) for managing Optical parameters associated with Wavelength Division Multiplexing (WDM) systems in accordance with the Interface Application Identifier approach defined in ITU-T Recommendation G.694.1.[ITU.G694.1] and its extensions.

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## Table of Contents

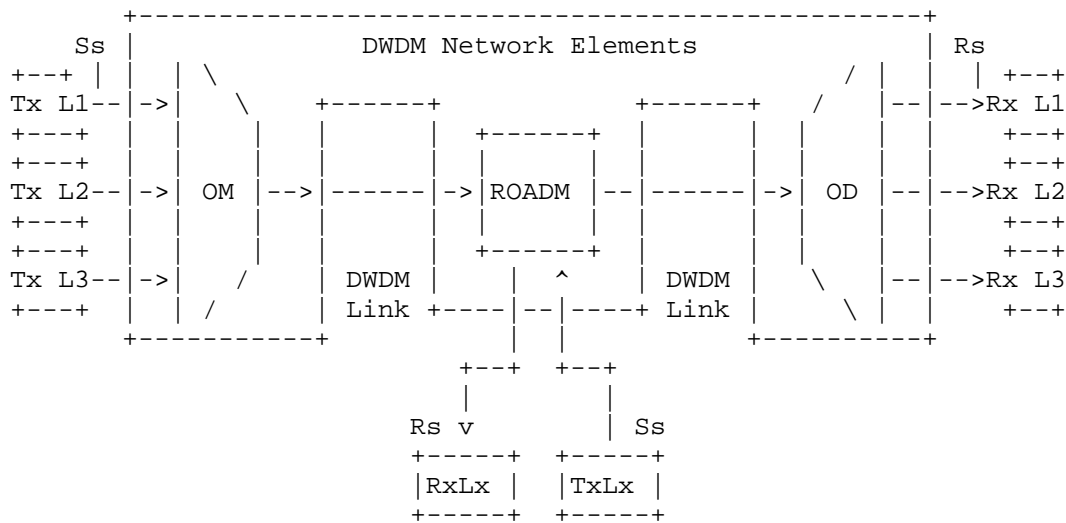
1. Introduction . . . . .	2
2. DWDM line system . . . . .	3
3. Use Cases . . . . .	4
4. Extensions to LMP-WDM Protocol . . . . .	4
5. General Parameters - OCh_General . . . . .	5
6. ApplicationIdentifier - OCh_ApplicationIdentifier . . . . .	6
7. OCh_Ss - OCh transmit parameters . . . . .	9
8. OCh_Rs - receive parameters . . . . .	9
9. Security Considerations . . . . .	10
10. IANA Considerations . . . . .	10
11. Contributors . . . . .	11
12. References . . . . .	11
12.1. Normative References . . . . .	11
12.2. Informative References . . . . .	12
Authors' Addresses . . . . .	13

## 1. Introduction

This extension addresses the use cases described by "draft-ietf-ccamp-dwdm-if-mng-ctrl-fwk-07". LMP [RFC4902] provides link property correlation capabilities that can be used between a transceiver device and an Optical Line System (OLS) device. Link property correlation is a procedure by which, intrinsic parameters and capabilities are exchanged between two ends of a link. Link property correlation as defined in RFC3591 allows either end of the link to supervise the received signal and operate within a commonly understood parameter window. Here the term 'link' refers in particular to the attachment link between OXC and OLS (see Figure 1). The relevant interface parameters are in line with "draft-dharini-ccamp-dwdm-if-yang-03".

## 2. DWDM line system

Figure 1 shows a set of reference points (Rs and Ss), for a single-channel connection between transmitter (Tx) and receiver (Rx) devices. Here the DWDM network elements in between those devices include an Optical Multiplexer (OM) and an Optical Demultiplexer (OD). In addition it may include one or more Optical Amplifiers (OA) and one or more Optical Add-Drop Multiplexers (ROADM).

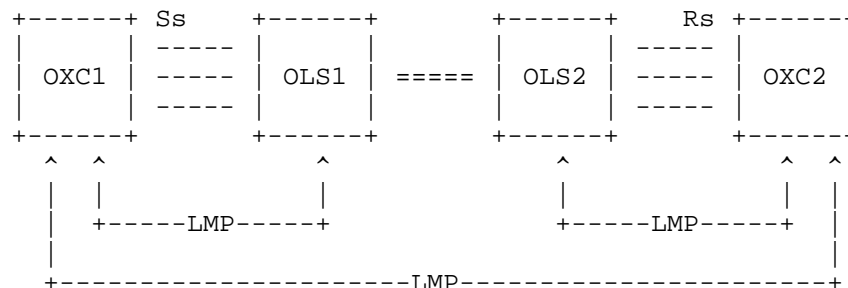


Ss = Sender reference point at the DWDM network element tributary output  
Rs = Receiver reference point at the DWDM network element tributary input  
Lx = Lambda x  
OM = Optical Mux  
OD = Optical Demux  
ROADM = Reconfigurable Optical Add Drop Mux

from Fig. 5.1/G.698.2

Figure 1: Linear Single Channel approach

Figure 2 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, Amplifier etc.  
 OLS to OLS   : represents the Optical Multiplex section  
               <xref target="ITU.G709"/>  
 Rs/Ss         : reference points in between the OXC and the OLS

Figure 2: Extended LMP Model

### 3. Use Cases

The use cases are described in draft-ietf-ccamp-dwdm-if-mng-ctrl-fwk

### 4. Extensions to LMP-WDM Protocol

This document defines extensions to [RFC4209] to allow a set of characteristic parameters, to be exchanged between a router or optical switch (e.g. OTN cross connect) 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. 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]

- OCh\_General (sub-object Type = TBA)
- OCh\_ApplicationIdentifier (sub-object Type = TBA)
- OCh\_Ss (sub-object Type = TBA)
- OCh\_Rs (sub-object Type = TBA)

## 5. General Parameters - OCh\_General

These are a set of general parameters as described in [G698.2] and [G.694.1]. Please refer to the "draft-galikunze-ccamp-dwdm-if-snmp-mib-01" and "draft-dharini-ccamp-dwdm-if-yang-00" for more details about these parameters and the [RFC6205] for the wavelength definition.

The general parameters are

1. Central Frequency - (Tera Hz) 4 bytes (see RFC6205 sec.3.2)
2. Number of Application Identifiers (A.I.) Supported
3. Single-channel Application Identifier in use
4. Application Identifier Type in use
5. Application Identifier in use

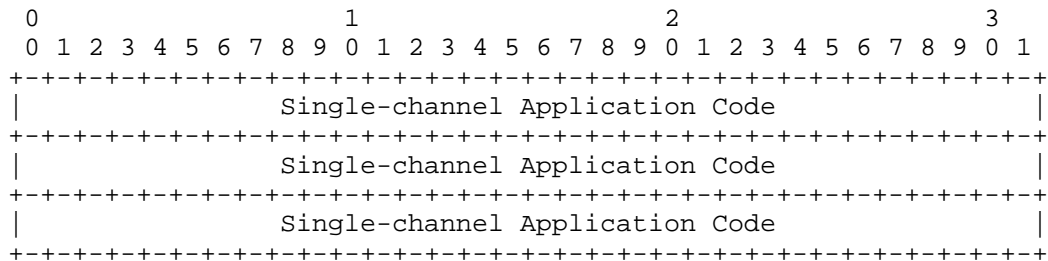
Figure 3: The format of the this sub-object (Type = TBA, Length = TBA) is as follows:

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	2	3	4	5	6	7	8	9
Type										Length										(Reserved)																			
Central Frequency																																							
Number of Application Identifiers Supported																				(Reserved)																			
Single-channel Application Identifier Number in use										A.I. Type in use										A.I. length																			
Single-channel Application Identifier in use																																							
Single-channel Application Identifier in use																																							
Single-channel Application Identifier in use																																							

A.I. Type in use: STANDARD, PROPRIETARY

A.I. Type in use: STANDARD

Refer to G.698.2 recommendation : B-DScW-ytz(v)



A.I. Type in use: PROPRIETARY

Note: if the A.I. type = PROPRIETARY, the first 6 Octets of the Application Identifier in use are six characters of the 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.

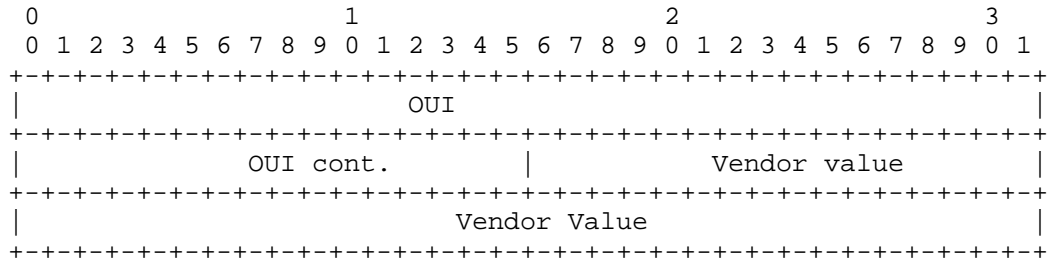


Figure 3: OCh\_General

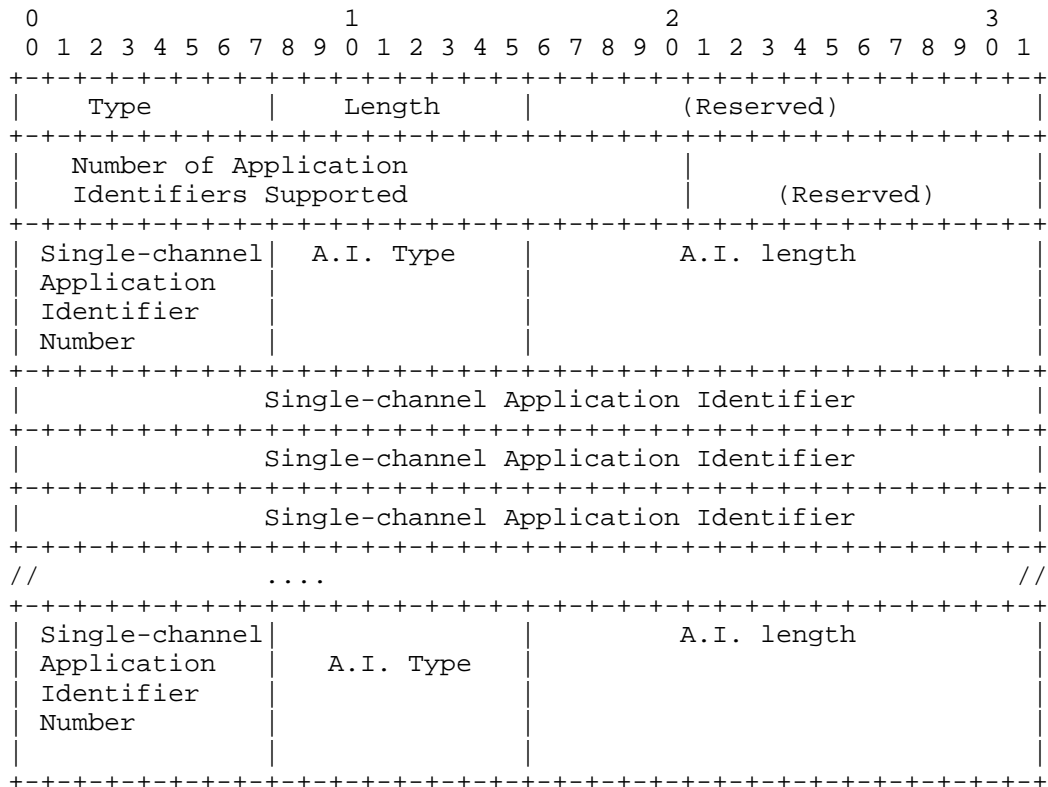
## 6. ApplicationIdentifier - OCh\_ApplicationIdentifier

This message is to exchange the application identifiers supported as described in [G698.2]. There can be more than one Application Identifier supported by the transmitter/receiver in the OXC. The number of application identifiers supported is exchanged in the "OCh\_General" message. (from [G698.1]/[G698.2]/[G959.1] and G.874.1)

The parameters are

1. Number of Application Identifiers (A.I.) Supported
  2. Single-channel application identifier Number  
uniquely identifies this entry - 8 bits
  3. Application Identifier Type (A.I.) (STANDARD/PROPRIETARY)
  4. Single-channel application identifier -- 96 bits  
(from [G698.1]/[G698.2]/[G959.1])
- this parameter can have  
multiple instances as the transceiver can support multiple  
application identifiers.

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



```

|                               Single-channel Application Identifier                               |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Single-channel Application Identifier                               |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Single-channel Application Identifier                               |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

A.I. Type in use: STANDARD, PROPRIETARY

A.I. Type in use: STANDARD

Refer to G.698.2 recommendation : B-DScW-ytz(v)

```

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
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Single-channel Application Code                               |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Single-channel Application Code                               |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Single-channel Application Code                               |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

A.I. Type in use: PROPRIETARY

Note: if the A.I. type = PROPRIETARY, the first 6 Octets of the Application Identifier in use are six characters of the 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.

```

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
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|                               OUI                                                         |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|                               OUI cont. |                               Vendor value          |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Vendor Value                                                |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

Figure 4: OCh\_ApplicationIdentifier

## 7. OCh\_Ss - OCh transmit parameters

These are the G.698.2 parameters at the Source(Ss reference points). Please refer to "draft-dharini-ccamp-dwdm-if-yang-03" for more details about these parameters.

### 1. Output power

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

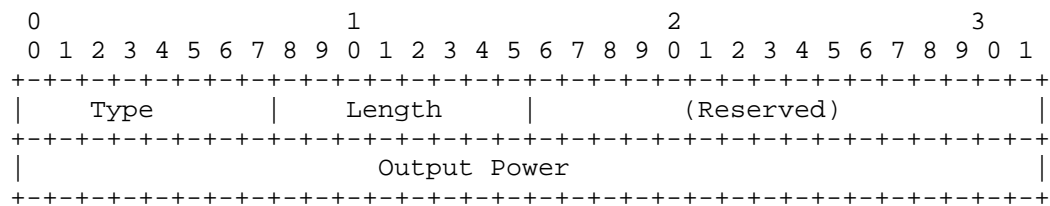


Figure 5: OCh\_Ss transmit parameters

## 8. OCh\_Rs - receive parameters

These are the G.698.2 parameters at the Sink (Rs reference points).

### 1. Current Input Power                      - (0.1dbm) 4bytes

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

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

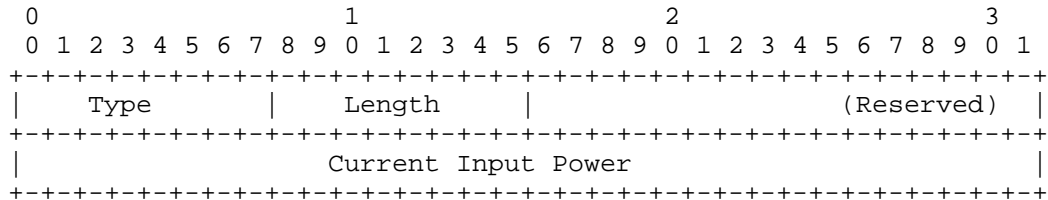


Figure 6: OCh\_Rs receive parameters

## 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 <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"/>)

- OCh\_General (sub-object Type = TBA)
- OCh\_ApplicationIdentifier (sub-object Type = TBA)
- OCh\_Ss (sub-object Type = TBA)
- OCh\_Rs (sub-object Type = TBA)

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