

MPLS Working Group  
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## **LDP Extensions for Optical User Network Interface (O-UNI) Signaling**

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### 1. Abstract

General requirements for signaling across the Optical UNI (O-UNI) are discussed in [1]. This draft describes extensions to the LDP protocol [2] to support those requirements. The LDP extensions described here address two areas:

- The addition of new TLVs to support the attributes required for lightpath establishment at the O-UNI

- Two new LDP messages to allow for the exchange of lightpath status information across the UNI.

The content of this draft is expected to evolve as work progresses on the optical UNI. This draft is a work in progress.

## 2. Conventions used in this document

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](#) [3].

## 3. Use of LDP for the O-UNI

This draft describes how LDP with extensions may be used as a signaling mechanism for the O-UNI. Several O-UNI abstract messages are defined in [1]. This draft shows how to use the existing LDP messages for that purpose. Two new LDP messages are introduced to meet the requirements for the exchange of status information across the O-UNI

### 3.1. Overview

LDP is one of the candidate protocols described in [1] for an O-UNI signaling implementation.

Applying LDP at the O-UNI allows for:

- The reuse of already defined LDP messages and message formats
- The reuse of LDP session management and control procedures
- Additions to the already specified procedures for notification of errors.
- The reuse of the LDP security mechanism

Support for the O-UNI signaling requirements depends upon the use of the following LDP behaviors and mechanisms as defined in [2].

- Use of Basic and/or Extended discovery mechanisms.
- Use of the Label Request Message in downstream on demand label advertisement mode with ordered control.

- Use of the Label Mapping Message in downstream on demand label advertisement mode with ordered control.
- Use of the Notification Message.
- Use of the Withdraw and Release Messages.

Additional messages are defined to support the propagation of lightpath status information as defined in [1].

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Additional TLVs are specified to support the lightpath attributes specified in [1]. Note: Additional work is required to define the format of these TLVs.

### 3.2. Use of LDP Messages for O-UNI

A set of abstract UNI messages is defined in [1]. Those abstract messages support the basic functions of the optical UNI. Those functions are, lightpath create, lightpath delete, lightpath modification, and lightpath status enquiry. Each of those functions is supported by a set of messages.

The procedures for handling LDP messages across the optical UNI are unchanged with the exception that:

The LDP FEC TLV SHOULD be ignored since it is not applicable at the UNI.

Note: The use of LDP messages for the optical UNI does not change the semantics of the LDP Message ID.

#### 3.2.1. Lightpath Create Action

For the lightpath create action, [1] defines two abstract messages, the lightpath Create Request and the Lightpath Create Response. The mapping of the LDP messages to fulfill the lightpath create action is:

- Lightpath Create Request: The create request function is achieved by the LDP Label Request Message. The Generalized Label

Request TLV defined in [4] is used to convey the lightpath attributes to the network side.

- Lightpath Create Response: The create response function is achieved by the use of the LDP Label Mapping Message. The create response function makes use of the Generalized label defined in [4]. The Label Mapping procedures are limited to downstream on demand, ordered control mode with conservative label retention mode.

### 3.2.2. Lightpath Delete Action

For the lightpath delete action, [1] defines two abstract messages, the Lightpath Delete Request and the Lightpath Delete Response. The mapping of the LDP messages to fulfill the function of the lightpath delete action is:

- Lightpath Delete Request: The delete request is achieved by the LDP Label Release Request Message. The Label Release Message is

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sent from the initiating client at any time depending on his need for the lightpath.

- Lightpath Delete Response: The delete Response is achieved by the LDP Label Withdraw Message.

### 3.2.3. Lightpath Modify Action

For the Lightpath modify action, [1] defines two abstract messages, The Lightpath Modification Request and the Lightpath Modification Response.

Lightpath modify action does not require the definition of new LDP message. The modify action follows the procedure described in [5].

### 3.2.4. Lightpath Status Enquiry Action

For the lightpath status enquiry action, [1] defines two abstract messages, Lightpath Status Enquiry and Lightpath Status Response

The Lightpath Status Enquiry and Lightpath Status Response functions require the definition of two new LDP messages, The Status Enquiry Message and the Status Response Message. The encoding of the new

messages is defined in the next section.

When an LSR receives a Status Enquiry message it generates an LDP Status Response Message. The Status Response message is useful for lightpath recovery after failure, it contains the attributes of lightpaths that are affected by failure.

### 3.2.5. Notification Action

The Notification function is similar in scope to that of the LDP Notification Message. Hence the LDP Notification message is used across the optical UNI for this purpose.

## 4. LDP Message Extensions

### 4.1. Label Request Message

Additional TLVs are added to the LDP Label Request Message as shown below:

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								
0  Label Request (0x0401)										Length																													
										Message ID																													
										FEC TLV																													

Generalized Label Request TLV																															
Source Termination Point TLV (O-UNI mandatory)																															
Destination Termination Point TLV (O-UNI mandatory)																															
Source User Group ID TLV (O-UNI mandatory)																															
Destination User Group ID TLV (O-UNI mandatory)																															

```

|          Contract ID TLV  (O-UNI mandatory)          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Transparency TLV  (O-UNI mandatory)          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Propagation Delay  (optional)                 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Lightpath Schedule TLV  (optional)            |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   Reserved                                                    |D|Service Level||
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Diversity TLV  (optional)                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Propagation Delay  (optional)                 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Optional Parameters                            |
+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

The Generalized Label TLV is as defined in [4]. The generalized Label Request TLV carries information regarding the span protection type, the lightpath encoding and bandwidth. Additional TLVs are added to the Label Request Message to accommodate lightpath attributes defined in [1]. D specifies the lightpath directionality as specified in [1].

#### 4.2. Label Mapping Message

Additional TLVs are added to the LDP Label Mapping Message as shown below:

```

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
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|0| Label Mapping (0x0400)          | Length          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Message ID          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          FEC TLV          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Generalized Label TLV          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+
|          Lightpath ID TLV(O-UNI mandatory)          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

```

|      Source Termination Point TLV (O-UNI mandatory)      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Destination Termination Point TLV (O-UNI mandatory)  |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Source User Group ID TLV  (O-UNI mandatory)          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Destination User Group ID TLV (O-UNI mandatory)      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Contract ID TLV  (O-UNI mandatory)                   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Reserved                                              |D|Service Level||
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Result Code TLV (O-UNI mandatory)                    |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Optional Parameters                                  |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

The Generalized Label TLV is as defined in [4]. The rest of the attributes are as defined in [1]. The Result code TLV reflects the result of the lightpath create process.

#### 4.3. The Label Release Message

The LightPath TLV is added to the LDP Label Release Message as shown below:

```

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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|0|  Label Release (0x0403)      |      Length      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Message ID      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      FEC TLV      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Lightpath ID TLV (O-UNI mandatory)      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Optional Parameters      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

#### 4.4. The Label Withdraw Message

Additional TLVs are added to the LDP Label WithDraw Message as shown below:

```

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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|0|  Label Withdraw (0x0402)      |      Length      |

```

```

+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Message ID                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     FEC TLV                                       |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Lightpath ID TLV (O-UNI mandatory)             |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Result Code TLV (O-UNI mandatory)             |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Optional Parameters                           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

#### 4.5. The Notification Message

The encoding for the Notification Message is:

```

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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|0| Notification (0x0001) | Length |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Message ID                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Lightpath ID (O-UNI mandatory)                 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Status TLV                                    |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     Optional Parameters                           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

The Status TLV is as defined in [2]. New status codes will be added to reflect the state of the lightpath.

#### 4.6. The Status Enquiry Message

The Status Enquiry Message is a new LDP message. The encoding for the Status Enquiry Message is:

```

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

```



```

+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|0|  Status Enquiry (0x0002)  |      Length      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|                                Message ID          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|                                Lightpath ID TLV     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|                                UNI-C ID  TLV       |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|                                Optional Parameters  |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

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The UNI-C is as defined in [6]. The Lightpath ID TLV is optional in the Status Enquiry Message. The UNI-C ID TLV is an O-UNI mandatory parameter if the Lightpath ID TLV does not exist. Otherwise, it is optional.

#### 4.7. The Status Response Message

The Status Response Message is a new LDP message. The encoding for the Status Response Message is:

```

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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|U|F|    0x0003                |      Length      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|                                Message ID          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|                                Lightpath ID TLV     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|      Source Termination Point TLV (optional)      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|      Destination Termination Point TLV (optional ) |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|      Source User Group ID  (optional)              |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|      Destination User Group ID  (optional)         |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
|      Contract ID TLV  (optional)                   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

```

+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Transparency TLV  (optional)               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Propagation Delay  (optional)               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Lightpath Schedule TLV  (optional)          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   Reserved                               |D|Service Level|   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Diversity TLV  (optional)                   |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Propagation Delay  (optional)               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Status TLV  (O-UNI mandatory)               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|               Optional Parameters                       |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

## 5. Security Considerations

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This draft has the same security consideration as in [2].

## 6. References

- 1 Rajagopalan, B. et. al., "Signaling Requirements at the IP-Optical Interface (UNI)" [draft-bala-mpls-uni-signaling-00.txt](#), work in progress, July 2000.
- 2 Andersson, L., et. al., "LDP Specifications", [draft-ietf-mpls-ldp-08.txt](#), work in progress, June 2000
- 3 Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997
- 4 P. Ashwood-Smith, "MPLS Optical/Switching Signaling Functional Description\_ IETF Draft, Work in Progress, June 2000.
- 5 Ash, J., et, al., "LSP Modification Using CR-LDP", [draft-ietf-mpls-](#)

[crlsp-modify-01.txt](#), work in progress, Feb. 2000.

- 6 K. Bala, et. al., "User Network Interface 1.0 Proposal " OIF Contribution, OIF2000.125, June 2000.

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