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LDP Extensions for Lock Instruct and Loopback of Pseudowire in MPLS Transport Profile
draft-dong-pwe3-mpls-tp-li-lb-03

Abstract

This document specifies extensions to the Label Distribution Protocol (LDP) to support provisioning of lock instruct and loopback mechanism for MPLS-TP Pseudowires.

Requirements Language

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].

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 October 20, 2013.

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1. Introduction

The requirements for Lock Instruct (LI) and Loopback (LB) are specified in [RFC5860], and the framework of LI and LB is specified in [RFC6371]. [RFC6435] defines management plane based Lock Instruct (LI) and Loopback (LB) mechanisms, and an LI OAM message can be used for additional lock coordination between the MEPs. Management plane based LI and LB is suitable for scenarios where dynamic control plane is not available.

When a dynamic control plane is used for establishing MPLS-TP pseudowires (PWs), it's natural to use and extend the control plane protocol to provision LI and LB functions. Unlike other OAM mechanisms, LI and LB would modify the forwarding plane of a PW, thus without the involvement of control plane this may result in inconsistency between control plane and data plane. Besides, with control plane based mechanism, it does not need to rely on the TTL expiration to make the OAM requests reach particular MIP or MEP.

There are some existing control plane based OAM provisioning mechanisms for MPLS-TP. For example, [I-D.ietf-pwe3-oam-config] specifies the LDP extensions for the configuration of proactive OAM functions for MPLS-TP PWs when control plane is used.

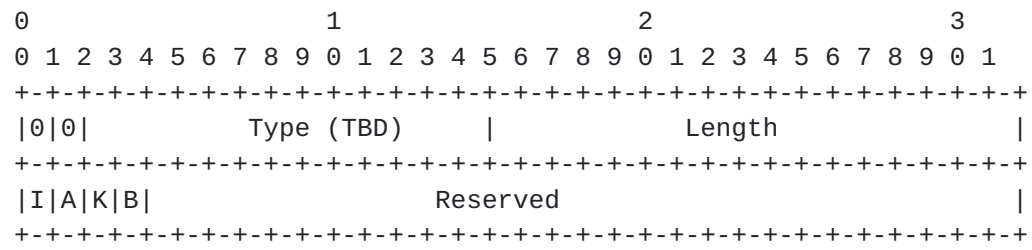
This document defines mechanisms similar to [I-D.ietf-pwe3-oam-config] to implement LI and LB functions for MPLS-TP PWs when MPLS-TP control plane is used. The mechanisms defined in this document are complementary to [RFC6435].

2. LDP Extensions

2.1. Extensions to MPLS-TP PW OAM Administration TLV

Two new flags (Lock bit and Loopback bit) are defined in MPLS-TP PW OAM Administration TLV [I-D.ietf-pwe3-oam-config].

Format of extended MPLS-TP PW OAM Administration TLV is as below:



Lock (K): When this bit is set, it indicates that the T-PE needs to enable "Lock" function for this PW.

Loopback (B): When this bit is set, it indicates that the target node of this message SHOULD enable loopback function for this PW.

2.2. Extensions to PW Status TLV

Two new Status bits are defined in PW Status TLV:

Bit Mask	Description	
TBD1	Pseudowire in Lock Mode	[this document]
TBD2	Pseudowire in Loopback Mode	[this document]

3. Operations

The control plane based Lock Instruct and Loopback functions are applicable to both Single-Segment Pseudowire (SS-PW) [RFC3985] [RFC4447] and Multi-Segment Pseudowire (MS-PW) [RFC5659] [RFC6073].

3.1. Lock Instruct

When a PE/T-PE wants to put a PW into lock mode, it MUST send a Mapping message with the Lock (K) bit in the MPLS-TP PW OAM Administration TLV set.

For SS-PW, when the Mapping message arrives at the remote PE, the receiving PE SHOULD try to take the PW out of service. If the receiving PE locks the PW successfully, it SHOULD send a Notification message with PW status "Pseudowire in Lock Mode". Otherwise, it SHOULD send a Notification message with the LDP Status code set to "PW Lock Failure".

For MS-PW, when the Mapping message arrives at a downstream S-PE, the receiving S-PE SHOULD forward this Mapping message with the K bit unchanged towards the remote T-PE. When the Mapping message arrives at the remote T-PE, it SHOULD try to take the PW out of service. If the receiving T-PE locks the PW successfully, it SHOULD send a Notification message with PW status "Pseudowire in Lock Mode" to the upstream S-PE. Otherwise, it SHOULD send a Notification message with the LDP Status code set to "PW Lock Failure". On receipt of the Notification message, the S-PEs would know whether the MS-PW is in lock mode or not, and the S-PEs SHOULD forward the Notification message back to the Source T-PE.

When the PE/T-PE wants to take the PW out of the lock mode, it MUST send a Mapping message with the Lock (K) bit in the MPLS-TP PW OAM Administration TLV cleared. The receiving PE/T-PE SHOULD try to unlock the PW. If the PW is unlocked successfully, the receiving PE/T-PE SHOULD send a Notification message with PW status bit "Pseudowire in Lock Mode" cleared. Otherwise, it SHOULD send a Notification message with the LDP Status code set to "PW Unlock Failure".

3.2. Loopback

When a PE/T-PE wants to put the remote PE/T-PE of a PW into loopback mode, it MUST send a Mapping message with both the Lock (K) bit and Loopback (B) bit in the MPLS-TP PW OAM Administration TLV set. When a T-PE wants to put a particular S-PE of the PW into loopback mode, it MUST send a Mapping message with both the Lock (K) bit and Loopback (B) bit set, and an Explicit Route Hop TLV(ER-Hop TLV) [I-D.ietf-pwe3-mspw-er] identifying the Target S-PE node MUST be carried in the Mapping message. The L flag in the ER-Hop TLV SHOULD be cleared. To ensure that the ER-Hop TLV identifies a single node as the Target S-PE, The PreLen field in the IPv4 prefix ER-Hop TLV SHOULD be set to 32, the PreLen field in the IPv6 prefix ER-Hop TLV SHOULD be set to 128, and the PreLen field in the L2 PW Address ER-Hop TLV SHOULD be set to 96. Information of the S-PE node can be collected using the SP-PE TLVs [RFC6073].

When the Mapping message arrives at the remote PE/T-PE, the receiving PE SHOULD try to put the PW in loopback mode. If the receiver node puts the PW into loopback mode successfully, it SHOULD send a Notification message with PW status "Pseudowire in Loopback Mode". Otherwise, it SHOULD send a Notification message with the LDP Status code set to "PW Enter Loopback Failure".

When a Mapping message with an ER-Hop TLV arrives an S-PE, the S-PE SHOULD check the ER-Hop TLV to see if it is the target S-PE of the message. If not, the S-PE SHOULD forward the message with the K and B bit unchanged to the next hop S-PE. When the Mapping message arrives at the target S-PE, the S-PE SHOULD parse the MPLS-TP PW OAM Administration TLV and try to put the PW into loopback mode. If the S-PE puts the PW into loopback mode successfully, it SHOULD send a Notification message with PW status set to "Pseudowire in Loopback Mode". An SP-PE TLV identifying the S-PE in loopback mode SHOULD also be carried in the Notification message. If the S-PE fails to put the PW into loopback mode, it SHOULD send a Notification message with the LDP Status code set to "PW Enter Loopback Failure". An SP-PE TLV identifying this S-PE SHOULD also be carried in the Notification message.

When the PE/T-PE wants to take the remote PE/T-PE out of the loopback mode, it MUST send a Mapping message with the Lock (K) bit set and Loopback (B) bit cleared. When the T-PE wants to take a particular S-PE out of loopback mode, the message MUST also carry an ER-Hop TLV to identify the target S-PE. If the PW is taken out of loopback mode successfully, the receiving PE/T-PE/S-PE SHOULD send a Notification message with PW status bit "Pseudowire in Loopback Mode" cleared. Otherwise, it SHOULD send a Notification message with the LDP Status code set to "PW Exit Loopback Failure". For the S-PE case, An SP-PE TLV identifying this S-PE node SHOULD also be carried in the Notification message.

4. IANA Considerations

Two bits ("Lock" (K) and "Loopback" (B)) as defined in section 2.1 need to be allocated in the MPLS-TP PW OAM Administration TLV.

Two new PW Status bits as defined in section 2.2 need to be allocated in the "Pseudowire Status Codes" Registry.

Four new LDP status codes need to be assigned by the IANA in the LDP "STATUS CODE NAME SPACE":

Range/Value	E	Description
TBA	0	PW Lock Failure
TBA	0	PW Unlock Failure

TBA	0	PW Enter Loopback Failure
TBA	0	PW Exit Loopback Failure

5. Security Considerations

TBD

6. References

6.1. Normative References

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6.2. Informative References

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