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J. Dong
M. Chen
Huawei Technologies
Z. Li
China Mobile
D. Ceccarelli
Ericsson
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GMPLS RSVP-TE Extensions for Lock Instruct and Loopback draft-ietf-ccamp-rsvp-te-li-lb-06

Abstract

This document specifies extensions to Resource Reservation Protocol-Traffic Engineering (RSVP-TE) to support Lock Instruct (LI) and Loopback (LB) mechanisms for Label Switched Paths (LSPs). These mechanisms are applicable to technologies which use Generalized Multi-Protocol Label Switching (GMPLS) as control plane.

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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1. Introduction

The requirements for Lock Instruct (LI) and Loopback (LB) in Multiprotocol Label Switching Transport Profile (MPLS-TP) are specified in [RFC5860], and the framework of LI and LB is specified in [RFC6371].

In general the LI and LB are useful Operations, Administration and Maintenance (OAM) functions for technologies which use Generalized Multi-Protocol Label Switching (GMPLS) as control plane, e.g. time-division multiplexing, wavelength-division multiplexing and packet switching. It is natural to use and extend the GMPLS control plane protocol to provide a unified approach for LI and LB provisioning in all these technologies.

[I-D.ietf-ccamp-rsvp-te-mpls-tp-oam-ext] specifies the RSVP-TE extensions for the configuration of pro-active MPLS-TP OAM functions, such as Continuity Check (CC), Connectivity Verification (CV), Delay Measurement (DM) and Loss Measurement (LM). The provisioning of on-demand OAM functions such as LI and LB are not covered in that document.

This document specifies extensions to Resource Reservation Protocol-Traffic Engineering (RSVP-TE) to support lock instruct and loopback mechanisms for Label Switched Paths (LSPs). The mechanisms are applicable to technologies which use GMPLS as control plane. For MPLS-TP network, the mechanisms defined in this document are complementary to [RFC6435].

2. Flag Definitions for LI and LB

2.1. Lock Instruct Indication

In order to indicate the lock/unlock of the LSP, the A (Administratively down) bit in ADMIN_STATUS object [RFC3471] [RFC3473] is used. The format of ADMIN_STATUS Object is as below:

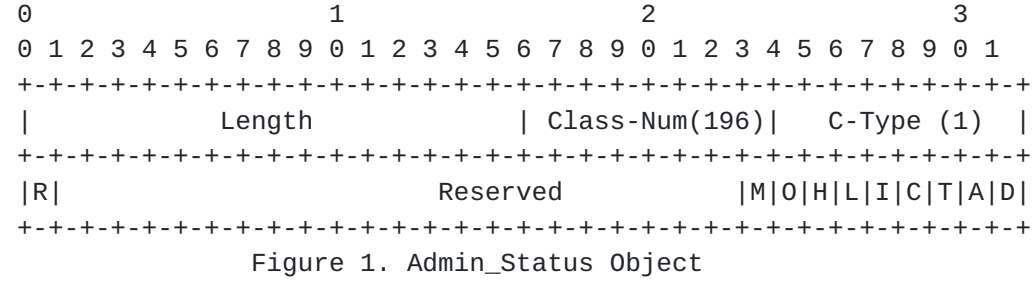

Figure 1. Admin_Status Object

Reflect (R): 1 bit - see [RFC3471]
OAM Flows Enabled (M): 1 bit - see [RFC7260]
OAM Alarms Enabled (O): 1 bit - see [RFC7260]
Handover (H): 1 bit - see [RFC5852]
Lockout (L): 1 bit - see [RFC4872]
Inhibit Alarm Indication (I): 1 bit - see [RFC4783]
Call Control (C): 1 bit - see [RFC4974]
Testing (T): 1 bit - see [RFC3471]
Administratively down (A): 1 bit - see [RFC3471], reused for Lock
Deletion in progress (D): 1 bit - see [RFC3471]

2.2. Extensions for Loopback

In order to indicate the loopback mode of LSP, a new bit flag is defined in the Attribute Flags TLV [RFC5420].

Loopback flag:

This flag indicates a particular node on the LSP is required to enter loopback mode. This can also be used for specifying the loopback state of the node.

- Bit number: TBA

- Attribute flag carried in Path message: Yes

- Attribute flag carried in Resv message: No

- Attribute flag carried in RRO Attributes subobject: Yes

3. Operational Procedures

3.1. Lock Instruct

When an ingress Label Switching Router (LSR) intends to put an LSP into lock mode, it MUST send a Path message with the Administratively down (A) bit defined above and the Reflect (R) bit in ADMIN_STATUS Object set.

On receipt of this Path message, the egress LSR SHOULD try to take the LSP out of service. If the egress LSR locks the LSP successfully, it MUST send a Resv message with the A bit in ADMIN_STATUS object set. Otherwise, it MUST send a PathErr message with the Error Code "OAM Problem" [RFC7260] and the new Error Value "Lock Failure", and the following Resv messages MUST be sent with the A bit cleared.

When an LSP is put in lock mode, the subsequent Path and Resv messages SHOULD keep the A bit in ADMIN_STATUS Object set.

When the ingress LSR intends to take the LSP out of the lock mode, it MUST send a Path message with the A bit in ADMIN_STATUS Object cleared.

On receipt of this Path message, the egress LSR SHOULD try to bring the LSP back to service. If the egress LSR unlocks the LSP successfully, it MUST send a Resv message with the A bit in ADMIN_STATUS Object cleared. Otherwise, it MUST send a PathErr message with the Error Code "OAM Problem" [RFC7260] and the new Error Value "Unlock Failure", and the following Resv messages MUST be sent with the A bit set.

When an LSP is taken out of lock mode, the subsequent Path and Resv messages SHOULD keep the A bit in ADMIN_STATUS Object cleared.

3.2. Loopback

The loopback request can be sent either to the egress LSR or to a particular intermediate node. The mechanism defined in [I-D.ietf-ccamp-lsp-attribute-ro] is used for addressing the loopback request to a particular node on the LSP. The ingress LSR MUST ensure that the LSP is in lock mode before it requests setting a particular node on the LSP into loopback mode.

When a ingress LSR intends to put a particular node on the LSP into loopback mode, it MUST send a Path message with the Loopback bit defined above in the Attribute Flags TLV set. The mechanism defined in [I-D.ietf-ccamp-lsp-attribute-ro] is used to address the loopback request to the particular LSR. The Administratively down (A) bit in ADMIN_STATUS object MUST be kept set to indicate that the LSP is still in lock mode.

On receipt of this Path message, the target LSR of the loopback request SHOULD try to put the LSP into loopback mode. If the node puts the LSP into loopback mode successfully, it MUST set the Loopback (B) bit in the Record Route Object (RRO) Attribute subobject [RFC5420] and push this subobject onto the RRO object in the corresponding Resv message. The Administratively down (A) bit in ADMIN_STATUS object MUST be kept set in the Resv message. If the node cannot put the LSP into loopback mode, it MUST send a PathErr message with the Error Code "OAM Problem" [RFC7260] and the new Error Value "Loopback Failure".

When the ingress LSR intends to take the particular node out of loopback mode, it MUST send a Path message with the Loopback (B) bit in the Attribute Flags TLV cleared. The mechanism defined in [I-D.ietf-ccamp-lsp-attribute-ro] is used to indicate that the particular LSR SHOULD exit loopback mode for this LSP. The Administratively down (A) bit in ADMIN_STATUS object MUST be kept set to indicate the LSP is still in lock mode.

On receipt of this Path message, the target LSR SHOULD try to take the LSP out of loopback mode. If the node takes the LSP out of loopback mode successfully, it MUST clear the Loopback (B) Bit in the RRO Attribute subobject and push this subobject onto the RRO object in the corresponding Resv message. The Administratively down (A) Bit in ADMIN_STATUS Object MUST be kept set in the Resv message. Otherwise, the node MUST send a PathErr message with the Error Code "OAM Problem" [RFC7260] and the new Error Value "Exit Loopback Failure".

After the loopback mode is cleared successfully, the ingress LSR MAY remove the Lock Instruct using the mechanism defined in section 3.1.

4. IANA Considerations

IANA is requested to administer the assignment of new values defined in this document and summarized in this section.

4.1. Attribute Flags

IANA maintains a registry called "Resource Reservation Protocol-Traffic Engineering (RSVP-TE) Parameters" with a sub-registry called "Attribute Flags".

IANA is requested to assign a new bit flag as follows:

Bit No.	Name	Attribute Flags Path	Attribute Flags Resv	RRO	Reference
TBA	Loopback	Yes	No	Yes	this document

4.2. RSVP Error Value Sub-codes

IANA maintains a registry called "Resource Reservation Protocol (RSVP) Parameters" with a sub-registry called "Error Codes and Globally-Defined Error Value Sub-Codes".

IANA is requested to assign four new Error Value sub-codes for the "OAM Problem" Error Code:

Value	Description	Reference
TBA	Lock Failure	this document
TBA	Unlock Failure	this document
TBA	Loopback Failure	this document
TBA	Exit Loopback Failure	this document

5. Security Considerations

This document does not introduce any new security issues above those identified in [RFC3209] and [RFC3473]. For a more comprehensive discussion of GMPLS security and attack mitigation techniques, please see the Security Framework for MPLS and GMPLS Networks [RFC5920].

6. Acknowledgements

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Authors' Addresses

Jie Dong
Huawei Technologies
Huawei Campus, No.156 Beiqing Rd.
Beijing 100095
China

Email: jie.dong@huawei.com

Mach(Guoyi) Chen
Huawei Technologies
Huawei Campus, No.156 Beiqing Rd.
Beijing 100095
China

Email: mach.chen@huawei.com

Zhenqiang Li
China Mobile
Unit2, Dacheng Plaza, No. 28 Xuanwumenxi Ave.
Beijing 100053
China

Email: lizhenqiang@chinamobile.com

Daniele Ceccarelli
Ericsson
Via A. Negrone 1/A
Genova - Sestri Ponente
Italy

Email: daniele.ceccarelli@ericsson.com