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**GMPLS RSVP-TE Extensions for Lock Instruct and Loopback  
draft-ietf-ccamp-rsvp-te-li-lb-05**

**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](#)].

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## Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">2</a>
<a href="#">2.</a>	Flag Definitions for LI and LB . . . . .	<a href="#">3</a>
<a href="#">2.1.</a>	Extensions for Lock Instruct . . . . .	<a href="#">3</a>
<a href="#">2.2.</a>	Extensions for Loopback . . . . .	<a href="#">3</a>
<a href="#">3.</a>	Operational Procedures . . . . .	<a href="#">4</a>
<a href="#">3.1.</a>	Lock Instruct . . . . .	<a href="#">4</a>
<a href="#">3.2.</a>	Loopback . . . . .	<a href="#">5</a>
<a href="#">4.</a>	IANA Considerations . . . . .	<a href="#">6</a>
<a href="#">4.1.</a>	Attribute Flags . . . . .	<a href="#">6</a>
<a href="#">4.2.</a>	RSVP Error Value Sub-codes . . . . .	<a href="#">6</a>
<a href="#">5.</a>	Security Considerations . . . . .	<a href="#">6</a>
<a href="#">6.</a>	Acknowledgements . . . . .	<a href="#">6</a>
<a href="#">7.</a>	References . . . . .	<a href="#">7</a>
<a href="#">7.1.</a>	Normative References . . . . .	<a href="#">7</a>
<a href="#">7.2.</a>	Informative References . . . . .	<a href="#">7</a>
	Authors' Addresses . . . . .	<a href="#">8</a>

## [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.



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 SHOULD send a Resv message with the A bit in ADMIN\_STATUS object set. Otherwise, it SHOULD send a PathErr message with the Error Code "OAM Problem" [[RFC7260](#)] and the new Error Value "Lock Failure", and the following Resv messages SHOULD 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 SHOULD send a Resv message with the A bit in ADMIN\_STATUS Object cleared. Otherwise, it SHOULD send a PathErr message with the Error Code "OAM Problem" [[RFC7260](#)] and the new Error Value "Unlock Failure", and the following Resv messages SHOULD 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 loopback request is acceptable only when the LSP is already in lock mode.

When a ingress LSR intends to put a particular LSR 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 SHOULD 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 SHOULD 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 SHOULD be kept set in the Resv message. If the node cannot put the LSP into loopback mode, it SHOULD 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 LSP 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 SHOULD 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 SHOULD 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 SHOULD be kept set in the Resv message. Otherwise, the node SHOULD send a PathErr message with the Error Code "OAM Problem" [\[RFC7260\]](#) and the new Error Value "Exit Loopback Failure".





## 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	Attribute Path	Attribute 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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## **7. References**

### **7.1. Normative References**

- [I-D.ietf-ccamp-lsp-attribute-ro]  
Margaria, C., Martinelli, G., Balls, S., and B. Wright,  
"LSP Attribute in ERO", [draft-ietf-ccamp-lsp-attribute-ro-05](#) (work in progress), October 2014.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC3209] Awduche, D., Berger, L., Gan, D., Li, T., Srinivasan, V., and G. Swallow, "RSVP-TE: Extensions to RSVP for LSP Tunnels", [RFC 3209](#), December 2001.
- [RFC3471] Berger, L., "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description", [RFC 3471](#), January 2003.
- [RFC3473] Berger, L., "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Extensions", [RFC 3473](#), January 2003.
- [RFC5420] Farrel, A., Papadimitriou, D., Vasseur, JP., and A. Ayyangarps, "Encoding of Attributes for MPLS LSP Establishment Using Resource Reservation Protocol Traffic Engineering (RSVP-TE)", [RFC 5420](#), February 2009.
- [RFC5860] Vigoureux, M., Ward, D., and M. Betts, "Requirements for Operations, Administration, and Maintenance (OAM) in MPLS Transport Networks", [RFC 5860](#), May 2010.
- [RFC7260] Takacs, A., Fedyk, D., and J. He, "GMPLS RSVP-TE Extensions for Operations, Administration, and Maintenance (OAM) Configuration", [RFC 7260](#), June 2014.

### **7.2. Informative References**

- [I-D.ietf-ccamp-rsvp-te-mpls-tp-oam-ext]  
Bellagamba, E., Andersson, L., Skoldstrom, P., Ward, D., and A. Takacs, "Configuration of Pro-Active Operations, Administration, and Maintenance (OAM) Functions for MPLS-based Transport Networks using RSVP-TE", [draft-ietf-ccamp-rsvp-te-mpls-tp-oam-ext-12](#) (work in progress), June 2013.
- [RFC4783] Berger, L., "GMPLS - Communication of Alarm Information", [RFC 4783](#), December 2006.



- [RFC4872] Lang, J., Rekhter, Y., and D. Papadimitriou, "RSVP-TE Extensions in Support of End-to-End Generalized Multi-Protocol Label Switching (GMPLS) Recovery", [RFC 4872](#), May 2007.
- [RFC4974] Papadimitriou, D. and A. Farrel, "Generalized MPLS (GMPLS) RSVP-TE Signaling Extensions in Support of Calls", [RFC 4974](#), August 2007.
- [RFC5852] Caviglia, D., Ceccarelli, D., Bramanti, D., Li, D., and S. Bardalai, "RSVP-TE Signaling Extension for LSP Handover from the Management Plane to the Control Plane in a GMPLS-Enabled Transport Network", [RFC 5852](#), April 2010.
- [RFC5920] Fang, L., "Security Framework for MPLS and GMPLS Networks", [RFC 5920](#), July 2010.
- [RFC6371] Busi, I. and D. Allan, "Operations, Administration, and Maintenance Framework for MPLS-Based Transport Networks", [RFC 6371](#), September 2011.
- [RFC6435] Boutros, S., Sivabalan, S., Aggarwal, R., Vigoureux, M., and X. Dai, "MPLS Transport Profile Lock Instruct and Loopback Functions", [RFC 6435](#), November 2011.

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