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L. Berger
Movaz Networks

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GMPLS Signaling Procedure for Egress Control

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Abstract

This document clarifies the procedures for the control of the label used on an output/downstream interface of the egress node of a Label Switched Path (LSP). This control is also known as "Egress Control". Support for Egress Control is implicit in Generalized Multi-Protocol Label Switching (GMPLS) Signaling. This document clarifies the specification of GMPLS Signaling and does not modify GMPLS signaling mechanisms and procedures.

1. Background

The ability to control the label used on the output/downstream interface of an egress node was one of the early requirements for GMPLS. In the initial GMPLS documents, this was called "Egress Control". As the GMPLS documents progressed, the ability to control a label on an egress interface was generalized to support control of a label on any interface. This generalization is seen in Section 6 of [RFC3471] and Section 5.1 of [RFC3473]. When this functionality was generalized, the procedures to support control of a label at the egress were also generalized. Although the result was intended to cover egress control, this intention is not clear to all. This note reiterates the procedures to cover control of a label used on an egress output/downstream interface.

For context, the following is the text from the GMPLS signalling document dated June 2000 about how ERO (Explicit Route Object) for egress control:

> 6. Egress Control
>
> The LSR at the head-end of an LSP can control the termination of the LSP by using the ERO. To terminate an LSP on a particular outgoing interface of the egress LSR, the head-end may specify the IP address of that interface as the last element in the ERO, provided that interface has an associated IP address.
>
> There are cases where the use of IP address doesn't provide enough information to uniquely identify the egress termination. One case is when the outgoing interface on the egress LSR is a component link of a link bundle. Another case is when it is desirable to "splice" two LSPs together, i.e., where the tail of the first LSP would be "spliced" into the head of the second LSP. This last case is more likely to be used in the non-PSC classes of links.
>
> 6.2. Procedures
>
> The Egress Label subobject may appear only as the last subobject in the ERO/ER. Appearance of this subobject anywhere else in the ERO/ER is treated as a "Bad strict node" error.
>
> During an LSP setup, when a node processing the ERO/RR performs Next Hop selection finds that the second subobject is an Egress Label Subobject, the node uses the information carried in this subobject to determine the handling of the data received over that LSP. Specifically, if the Link ID field of the subobject is non zero, then this field identifies a specific (outgoing) link of the node that should be used for sending all the data received over the LSP. If the Label field of the subobject is not Implicit NULL label, this field specifies the label that should be used as an outgoing label on the data received over the LSP.
>
> Procedures by which an LSR at the head-end of an LSP obtains the information needed to construct the Egress Label subobject are outside the scope of this document.

2. Egress Control Procedures

This section is intended to complement Sections 5.1.1 and 5.2.1 of [RFC3473]. The procedures described in those sections are not modified. This section clarifies procedures related to the label used on an egress output/downstream interface.

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 [RFC2119].

2.1. ERO Procedures

Egress Control occurs when the node processing an ERO is the egress and the ERO contains one or more subobjects related to the output/downstream interface. In this case, the outgoing/downstream interface is indicated in the ERO as the last listed local interface. Note that an interface may be numbered or unnumbered.

To support Egress Control, an egress checks to see whether the received ERO contains an outgoing/downstream interface. If it does, the type of the subobject or subobjects following the interface is examined. If the associated LSP is unidirectional, one subobject is examined. Two subobjects are examined for bidirectional LSPs. If the U-bit of the subobject being examined is clear (0), then the value of the label MUST be used for transmitting traffic associated with the LSP on the indicated outgoing/downstream interface.

If the U-bit of the subobject being examined is set (1), then the value of the label is used for upstream traffic associated with the bidirectional LSP. Specifically, the label value will be used for the traffic associated with the LSP that will be received on the indicated outgoing/downstream interface.

Per [RFC3473], any errors encountered while processing the ERO, including if the listed label(s) are not acceptable or cannot be supported in forwarding, SHOULD result in the generation of a PathErr message with the error code "Routing Error" and error value of "Bad Explicit Route Object".

2.2. RRO Procedures

If an ERO is used to specify outgoing interface information at the egress and label recording is indicated for the LSP, the egress should include the specified interface information and the specified label or labels in the corresponding RRO (Route Record Object).

3. Security Considerations

This document clarifies procedures defined in [RFC3473] but does not define any new procedures. As such, no new security considerations are introduced.

4. Acknowledgments

Valuable comments and input were received from Adrian Farrel, Alan Kullberg, and Dimitri Papadimitriou.

5. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[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.

Author's Address

Lou Berger
Movaz Networks, Inc.
7926 Jones Branch Drive
Suite 615
McLean VA, 22102

Phone: +1 703 847-1801
EMail: lberger@movaz.com

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