CCAMP
Internet-Draft
Intended status: Standards Track
Expires: January 16, 2014

C. Margaria, Ed.
Coriant GmbH
G. Martinelli
Cisco
S. Balls
B. Wright
Metaswitch

July 15, 2013

LSP Attribute in ERO
draft-ietf-ccamp-lsp-attribute-ro-02

Abstract

LSP attributes can be specified or recorded for whole path, but they cannot be targeted to a specific hop. This document proposes alternative ways to extend the semantic for RSVP ERO object to target LSP attributes to a specific hop.

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 January 16, 2014.

Table of Contents

1. Introduction

Generalized MPLS (GMPLS) Traffic Engineering (TE) Label Switched Paths (LSPs) can be route-constrained by making use of the Explicit Route (ERO) object and related sub-objects as defined in [RFC3209], [RFC3473], [RFC3477], [RFC4873], [RFC4874], [RFC5520] and [RFC5553]. Those route constraints are extended by a number of documents, including element defined in [RFC6163], [I-D.ietf-ccamp-wson-signaling], [I-D.dong-ccamp-rsvp-te-mpls-tp-li-lb] or [I-D.ali-ccamp-rc-objective-function-metric-bound], for example the WSON_SIGNALING object, Metric and Objective Function subobjects.

RSVP already supports generic extension of LSP attributes in [RFC5420]. In order to support current and future ERO constraint extensions this document defines a mechanism to target generic

attributes at a specific hop.

1.1. Contributing Authors

1.2. 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].

2. Requirements

The requirement is to provide a generic mechanism to carry information related to specific nodes when signaling an LSP. This document does not restrict what that information can be used for. A mechanism similar to LSP attribute defined [RFC5420] should be expressed in ERO and SERO objects. A new ERO sub-object is defined, containing a list of generic Hop attributes. The mechanism defined in this document limits itself to single HOP attributes, and does not address attributes valid for a LSP section [[This can be revised based on feedback]]

3. ERO Attribute

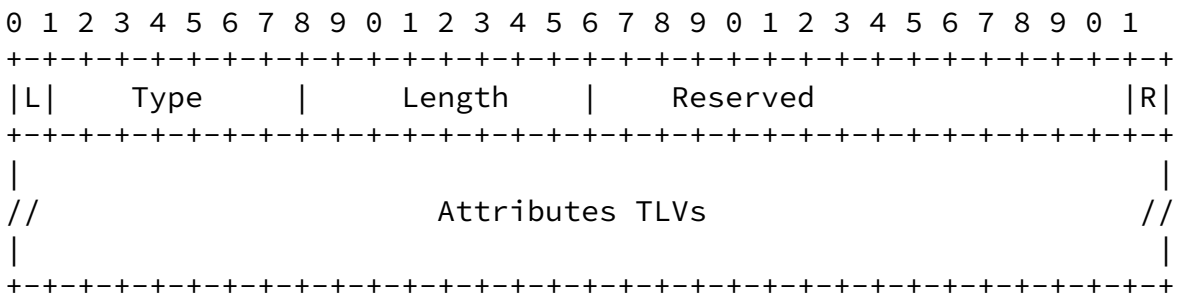
The ERO Attributes subobject may be carried in the ERO or SERO object if they are present. The subobject uses the standard format of an ERO subobject.

3.1. ERO_ATTRIBUTE subobject

The length is variable and content MUST be the same as for the LSP_ATTRIBUTE object with Attributes TLVs. The size of the ERO sub-object limits the size of the LSP Attribute TLV to 250 bytes. The typical size of currently defined and forthcoming LSP_ATTRIBUTE TLVs applicable to a specific hop (WSON_SIGNALING, OF and Metric) is not foreseen to exceed this limit.

The ERO attribute subobject is defined as follows:

0 1 2 3



See [RFC3209] for a description of L parameters. The attributes TLV are encoded as defined in section Section 3.2.

Type x TBD by IANA.

Length The Length contains the total length of the subobject in bytes, including the Type and Length fields. The Length MUST be always divisible by 4.

Reserved Reserved, must be set to 0 when the subobject is inserted in the ERO, MUST NOT be changed when a node process the ERO and must be ignored on the node addressed by the preceding ERO subobjects.

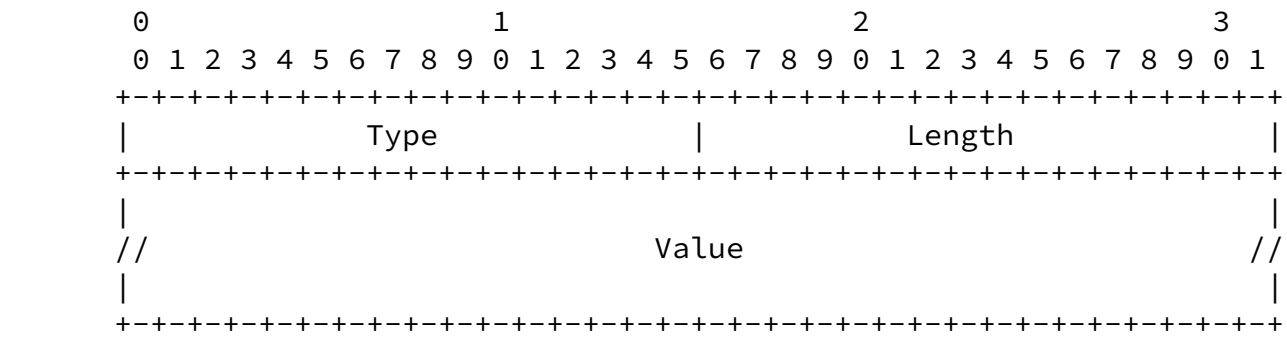
R This bit reflects the LSP_REQUIRED_ATTRIBUTE and LSP_ATTRIBUTE semantic defined in [RFC5420]. When set indicates required LSP attributes to be processed by the node, when cleared the LSP attributes are not required as described in Section 3.3.

Attributes TLVs as defined in Section 3.2 .

3.2. HOP Attributes TLVs

ERO Attributes carried by the new objects defined in this document are encoded within TLVs. One or more TLVs may be present in each object. There are no ordering rules for TLVs, and no interpretation should be placed on the order in which TLVs are received.

Each TLV is encoded as follows.



Type The identifier of the TLV..

Length Indicates the total length of the TLV in octets. That is, the combined length of the Type, Length, and Value fields, i.e., four plus the length of the Value field in octets. The entire TLV MUST be padded with between zero and three trailing zeros to make

it four-octet aligned. The Length field does not count any padding.

Value The data carried in the TLV.

3.3. Procedures

As described in [RFC3209] and [RFC3473] the ERO is managed as a list where each hop information starts with a subobject identifying an abstract node or link. The ERO attribute subobject must be appended after the existing subobjects defined in [RFC3209], [RFC3473], [RFC3477], [RFC4873], [RFC4874], [RFC5520] and [RFC5553]. Several ERO attribute subobject MAY be present, for each hop.

If a node is processing an ERO attribute subobject and does not support handling of the subobject it will behave as described in [RFC3209] when an unrecognized ERO subobject is encountered. This node will return a PathErr with error code "Routing Error" and error value "Bad EXPLICIT_ROUTE object" with the EXPLICIT_ROUTE object included, truncated (on the left) to the offending unrecognized subobject.

When the R bit is set a node MUST examine the attribute TLV present in the subobject following the rules described in [RFC5420] section 5.2. When the R bit is not set a node MUST examine the attribute TLV present in the subobject following the rules described in [RFC5420] section 4.2.

A node processing an ERO attribute subobject with an HOP attribute TLV longer than the ERO subobject SHOULD return a PathErr with error code "Routing Error" and error value "Bad EXPLICIT_ROUTE object" with the EXPLICIT_ROUTE object included, truncated (on the left) to the offending malformed subobject. The processing of the Hop attribute TLVs should be described in the documents defining them.

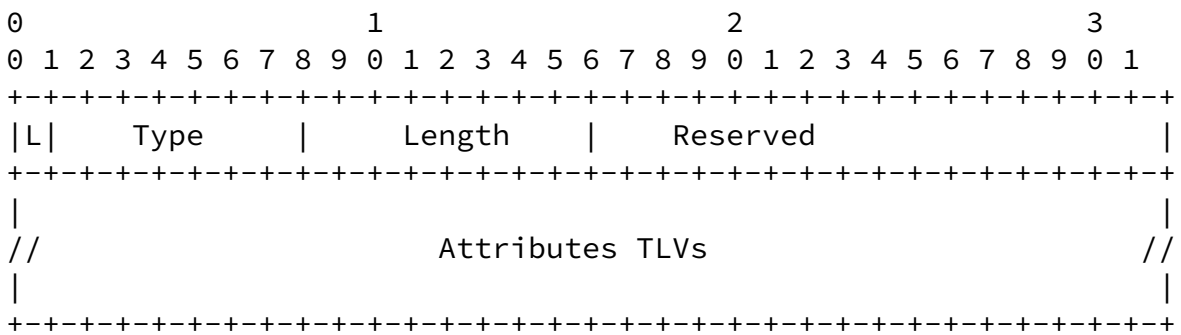
4. Recording Hop attribute per LSP

In some cases it is important to determine if an optional Hop attribute has been processed by a node.

4.1. RRO Hop Attributes subobject

The RRO Hop Attributes subobject may be carried in the RECORD_ROUTE object if it is present. The subobject uses the standard format of an RRO subobject.

The RRO Hop attribute subobject is defined as follows:



See [RFC3209] for a description of L parameters. The attributes TLV are encoded as defined in section Section 3.2.

Type x TBD by IANA.

Length The Length contains the total length of the subobject in bytes, including the Type and Length fields. The Length MUST be always divisible by 4.

Reserved Reserved, must be set to 0 when the subobject is inserted in the RRO, MUST NOT be changed when a node process the RRO and must be ignored on the node addressed by the preceding RRO subobjects.

Attributes TLVs The processed or addition HOP attributes, using the format defined in Section 3.2 .

4.2. Procedures

4.2.1. Subobject presence rule

The RRO rules defined in [RFC3209] are not changed. The RRO Hop attribute subobject must be pushed after the RRO attribute subobject (if present) defined in in [RFC5420]. The RRO Hop attribute subobject MAX be present between a pait of subobject identifying LSR or links. All such subobjects MUST be forwarded unmodified by transit LSRs.

4.2.2. Reporting Compliance with ERO Hop Attributes

To report that an ERO Hop attribute has been considered, or to report an additional attribute, an LSR MAY add a RRO Hop Attributes subobject with the HOP Attribute used. The requirement to report compliance MUST be specified in the document that defines the usage of an Hop attribute. [[This is not the most efficient encoding, a more efficient encoding would use a bit field ala RFC5420]]

5. IANA Considerations

TBD once a final approach has been chosen.

6. Security Considerations

None.

7. Acknowledgments

The authors would like to thanks Lou Berger for his directions and Attila Takacs for inspiring this [I-D.kern-ccamp-rsvpte-hop-attributes]. The authors also thanks Dirk Schroetter for his contribution to the initial versions of the documents (version -00 up to -02).

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Authors' Addresses

Cyril Margaria (editor)
Coriant GmbH
St Martin Strasse 76
Munich 81541
Germany

Phone: +49 89 5159 16934
Email: cyril.margaria@coriant.com

Giovanni Martinelli
Cisco
via Philips 12
Monza 20900
IT

Phone: +39 039 209 2044
Email: giomarti@cisco.com

Steve Balls
Metaswitch
100 Church Street
Enfield EN2 6BQ
UJ

Phone: +44 208 366 1177
Email: steve.balls@metaswitch.com

Ben Wright
Metaswitch
100 Church Street
Enfield EN2 6BQ
UJ

Phone: +44 208 366 1177
Email: Ben.Wright@metaswitch.com