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Zafar Ali
George Swallow
Clarence Filsfils
Matt Hartley
Ori Gerstel
Cisco Systems
Kenji Kumaki
KDDI Corporation
Ruediger Kunze
Deutsche Telekom AG
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Include Routes - Extension to Resource ReserVation Protocol-Traffic Engineering (RSVP-TE)

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Status of this Memo

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Abstract

There are scenarios that require two or more LSPs or segments of LSPs to follow same route in the network. This document specifies methods to communicate route inclusions along the loose hops during path setup using the Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) protocol.

Conventions used in this document

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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1. Introduction

There are scenarios that require two or more Label Switched Paths (LSPs) to follow same route in the network. E.g., many deployments require member LSPs of a bundle/ aggregated link (or Forwarding Adjacency (FA))) follow the same route. Possible reasons for two or more LSPs to follow the same end-to-end or

partial route include, but are not limited to:

. Fate sharing: an application may require that two or more LSPs fail together. In the example of bundle link this would

mean that if one component goes down, the entire bundle goes down.

. Homogeneous Attributes: it is often required that two or more LSPs have the same TE metrics like latency, latency variation, etc. In the example of a bundle/ aggregated link this would meet the requirement that all component links (FAs) of a bundle should have same latency and latency variation. As noted in [OSPF-TE-METRIC] and [ISIS-TE-METRIC], in certain networks, such as financial information networks, network performance (e.g. latency and latency variation) is becoming critical and hence having bundles with component links (FAs) with homogeneous latency and latency variation is important.

The RSVP-TE specification [RFC3209] and GMPLS extensions to RSVP-TE [RFC3473] allow abstract nodes and resources to be explicitly included in a path setup, e.g., using IPv4 prefix ERO subobject [RFC3209], IPv6 prefix ERO subobject [RFC3209] and Unnumbered Interface ID ERO subobject [RFC3477], etc. When a source node has full topological knowledge and is permitted to signal an Explicit Route Object, these methods can be used to satisfy the inclusion requirements mentioned above. However, there are scenarios when path computations are performed by remote nodes, thus there is a need for relevant inclusion requirements to be communicated to those nodes. These include (but are not limited to):

. LSPs with loose hops in the Explicit Route Object (ERO), e.g. inter-domain LSPs;

. Generalized Multi-Protocol Label Switching (GMPLS) User-Network Interface (UNI) where path computation may be performed by the (server layer) core node [RFC4208].

These use-cases require the relevant path-inclusion information to be communicated to the route expanding nodes. This document defines the necessary extensions to RSVP-TE protocol.

This document assumes that node expanding the route is normally a hop of the included LSP. Therefore, the node calculating or expanding the route of the signaled LSP has the knowledge of the inclusion route.

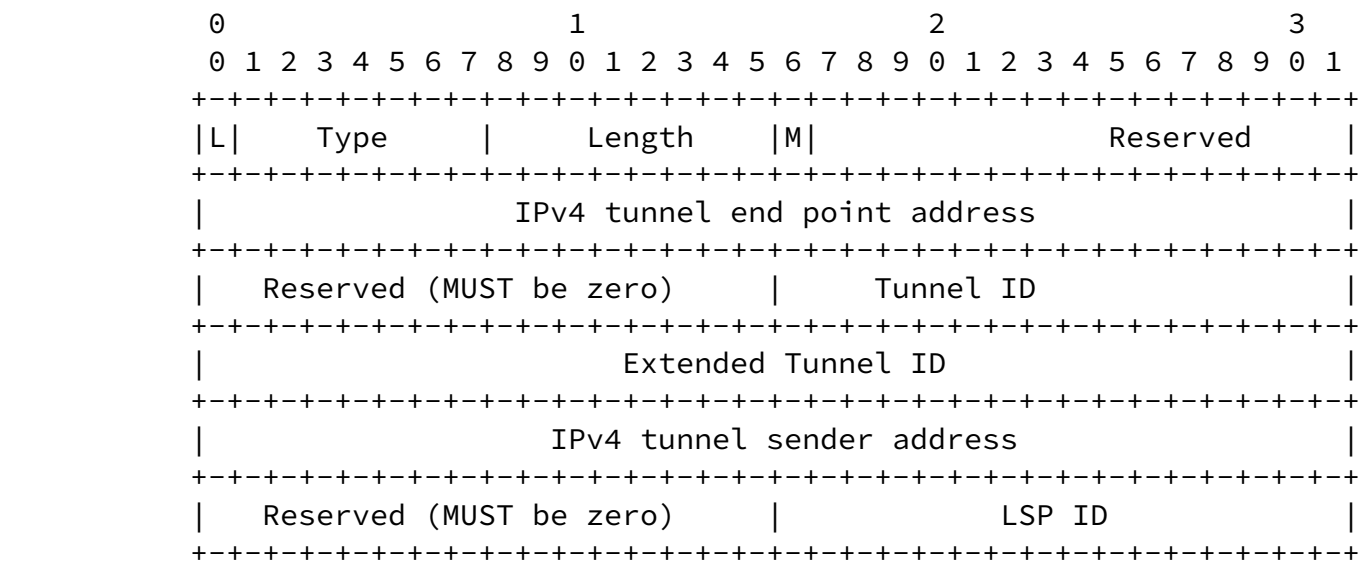
However, there is a race condition in which included LSP is yet to be signaled. This draft addresses this race condition, as detailed in Section 2.2.

2. RSVP-TE signaling extensions

New IPv4 and IPv6 Point-to-Point (P2P) Path ERO subobject types are defined in this document. These ERO subobjects are used to communicate path inclusion requirements to the ERO expanding node(s). For this purpose, the subobjects carry RSVP-TE Forwarding Equivalence Class (FEC) of the reference LSP who's Path is be used to expand the loose hop of the LSP being signaled.

2.1. IPv4 Point-to-Point Path ERO subobject

The IPv4 Point-to-Point Path ERO subobject is defined as follows:



L

The L bit is an attribute of the subobject. The L bit is set if the subobject represents a loose hop in the ERO. If the bit is not set, the subobject represents a strict hop in the explicit route.

This document only defines the use of the subobject in loose hopes in the ERO, i.e., L bit MUST of set to 1.

Type

IPv4 Point-to-Point Path ERO subobject
(to be assigned by IANA; suggested value: 38).

Length

The length contains the total length of the subobject in bytes, including the type and length fields. The length is always 24.

M bit: When "mandatory inclusion" bit is set, the route of the LSP being signaled MUST follow the path specified by the Path ERO subobject. When mandatory inclusion is not set, the route of the LSP being signaled SHOULD follow the path specified by the Path ERO subobject.

The remaining fields are used to specify RSVP-TE FEC of the reference LSP who's Path is be used to expand the route of the LSP being signaled. Specifically,

Tunnel ID

Tunnel ID of the reference LSP who's Path is be used to expand the route of the LSP being signaled.

Extended Tunnel ID

Extended Tunnel ID of the reference LSP who's Path is be used to expand the route of the LSP being signaled.

IPv4 tunnel sender address

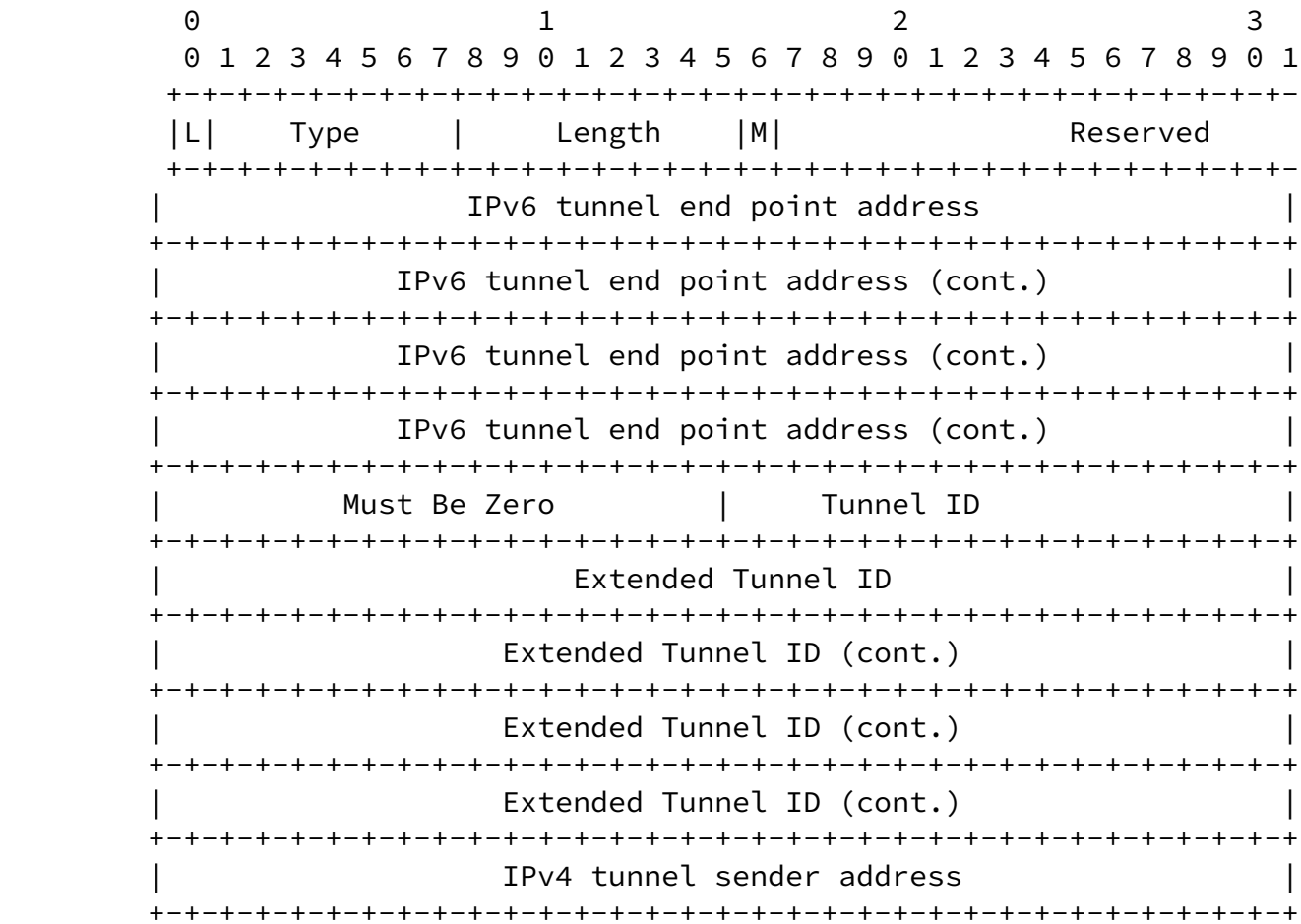
IPv4 tunnel sender address of the reference LSP who's path is be used to expand the route of the LSP being signaled.

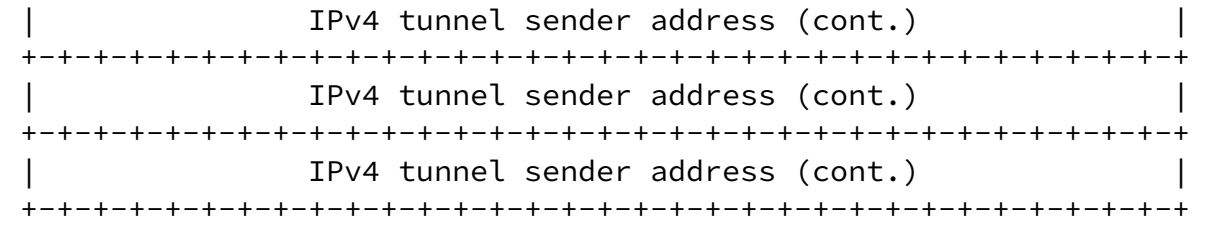
LSP ID

LSP ID of the reference LSP who's Path is be used to expand the route of the LSP being signaled.

2.2. IPv6 Point-to-Point Path ERO subobject

The IPv6 Point-to-Point Path ERO subobject is defined as follows:





L

The L bit is an attribute of the subobject. The L bit is set if the subobject represents a loose hop in the ERO. If the bit is not set, the subobject represents a strict hop in the explicit route.

This document only defines the use of the subobject in loose hopes in the ERO, i.e., L bit MUST of set to 1.

Type

IPv6 Point-to-Point Path ERO subobject

(to be assigned by IANA; suggested value: 39).

Length

The length contains the total length of the subobject in bytes, including the type and length fields. The length is always 48.

M bit: The M bit usage is as defined for the M bit of IPv4 Point-to-Point Path ERO subobject.

The remaining fields are used to specific RSVP-TE FEC of the reference LSP who's Path is be used to expand the route of the LSP being signaled, as detailed in Section 2.1.

2.3. Processing rules for Path ERO subobjects

The basic processing rules of an ERO are not altered. Please refer to [RFC3209] for details.

If an LSR strips all local subobjects from an ERO carried in a Path message (according to the procedures in [RFC3209]) and finds that the next subobject is an IPv4 P2P Path ERO subobject or IPv6 P2P LSP subject, it MUST attempt to resolve the Path ERO subobject as described in the following.

If the L bit of the Path ERO subobject is not set, i.e., the subobject represents a strict hop in the explicit route, the processing node MUST respond with a PathErr message with the error code "Routing Problem" (24) and the error value "Bad initial subobject" (4).

If the M bit is set, the processing node follows the following procedure:

- If the path taken by the LSP referenced in the Path ERO subobject is known to the processing node and the path contains the loose abstract node in the ERO hop, the processing node MUST ensure that loose hop expansion to the next abstract node follows the referenced path.

- If the path taken by the LSP referenced in the Path ERO subobject does not contain the loose abstract node in the ERO hop, the processing node MUST sent a PathErr message with the error code "Routing Problem" (24) and the new error value

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"unknown or inconsistent LSP suboject" (value to be assigned by IANA) for the signaled LSP.

- If the path referenced in the LSP subobject is unknown to the processing node, the processing node SHOULD ignore the Path ERO subobject and SHOULD proceed with the signaling request. After sending the Resv for the signaled LSP, the processing node SHOULD return a PathErr with the error code "Notify Error" (25) and error sub-code "TBD" (value to be assigned by IANA, suggested value: TBD) for the signaled LSP.

If the M bit is not set, the processing node follows the following procedure:

- If the path taken by the LSP referenced in the Path ERO subobject is known to the processing node and the path contains the loose abstract node in the ERO hop, the

processing node SHOULD ensure that loose hop expansion to the next abstract node follows the referenced path.

- If the path taken by the LSP referenced in the Path ERO subobject is unknown to the processing node and/ or the referenced path does not contain the loose abstract node in the ERO hop, the processing node SHOULD ignore the route inclusion specified in the Path ERO subobject and SHOULD compute a suitable path to the loose abstract node in the ERO hop and proceed with the signaling request. After sending the Resv for the signaled LSP, the processing node SHOULD return a PathErr with the error code "Notify Error" (25) and error sub-code " unknown or inconsistent LSP suboject" (value to be assigned by IANA) for the signaled LSP.

3. Security Considerations

This document does not introduce any additional security issues above those identified in [RFC5920], [RFC2205], [RFC3209], and [RFC3473] and [RFC4874].

4. IANA Considerations

4.1. New ERO subobject types

This document adds the following new subobject of the existing entry for ERO (20, EXPLICIT_ROUTE):

Value	Description
TBA	IPv4 Point-to-Point Path ERO subobject
TBA	IPv6 Point-to-Point Path ERO subobject

These subobject may be present in the Explicit Route Object, but not in the Route Record Object.

4.2. New RSVP error sub-codes

IANA registry: RSVP PARAMETERS
Subsection: Error Codes and Globally-Defined Error Value Sub-Codes

For Error Code "Routing Problem" (24) (see [RFC3209]) the following sub-codes are defined.

Sub-code	Value
Unknown or inconsistent LSP suboject	To be assigned by IANA.

For Error Code "Notify Error" (25) (see [RFC3209]) the following sub-codes are defined.

Sub-code	Value
Unknown or inconsistent LSP suboject	To be assigned by IANA.

5. Acknowledgments

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6. References

6.1. Normative References

[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.

[RFC3473] Berger, L., "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Extensions", RFC 3473, January 2003.

6.2. Informative References

[RFC4208] Swallow, G., Drake, J., Ishimatsu, H., and Y. Rekhter, "Generalized Multiprotocol Label Switching (GMPLS) User-Network Interface (UNI): Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Support for the Overlay Model", RFC 4208, October 2005.

[RFC6001] Papadimitriou, D., Vigoureux, M., Shiomoto, K., Brungard, D., and JL. Le Roux, "Generalized MPLS (GMPLS) Protocol Extensions for Multi-Layer and Multi-Region Networks (MLN/MRN)", RFC 6001, October 2010.

[RFC3477] Kompella, K. and Y. Rekhter, "Signalling Unnumbered Links in Resource ReSerVation Protocol - Traffic Engineering (RSVP-TE)", RFC 3477, January 2003.

[RFC2209] Braden, R. and L. Zhang, "Resource ReSerVation Protocol (RSVP) -- Version 1 Message Processing Rules", RFC 2209, September 1997.

[RFC5920] Fang, L., Ed., "Security Framework for MPLS and GMPLS Networks", RFC 5920, July 2010.

Authors' Addresses

Zafar Ali
Cisco Systems, Inc.

Email: zali@cisco.com

George Swallow
Cisco Systems, Inc.
swallow@cisco.com

Clarence Filsfils
Cisco Systems, Inc.
cfilsfil@cisco.com

Matt Hartley
Cisco Systems
Email: mhartley@cisco.com

Ori Gerstel
Cisco Systems
ogerstel@cisco.com

Kenji Kumaki
KDDI Corporation
Email: ke-kumaki@kddi.com

Rudiger Kunze
Deutsche Telekom AG
Ruediger.Kunze@telekom.de