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RSVP-TE Extensions for RRO Editing
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Abstract

This document provides extensions for the Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) to allow the communication of changes made by a node to the information provided by other nodes in a ROUTE_RECORD Object (RRO) in Path and Resv messages, or to indicate that it has itself provided incomplete information.

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].

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1. Introduction

The signaling process of a Label-Switched Path (LSP) may require gathering information of the actual path traversed by the LSP. The procedure for collecting this information includes the hop-by-hop construction of a Record Route Object (RRO) in the Path and Resv messages, containing information about the path traversed by the LSP ([RFC-3209], [RFC-3473], [RFC-4873], [RFC-5420], [RFC-5553], [DRAFT-SRLG], [DRAFT-METRIC]). There are cases, described in this document, in which one or more nodes on the path of an LSP may require that the data contained in the RRO in the Path and/or Resv be removed or

summarized. However, it is important for the ingress or egress nodes to know which RRO subobjects have been edited by intermediate nodes. This document addresses this requirement.

1.1. Use Cases

1.1.1. Overlay and Multi-domain Networks

In the GMPLS overlay model there is a client-server relationship [RFC4208]. The GMPLS User-Network Interface (UNI) is the reference point where policies may be applied. In this case, policy at the server network boundary may require that some or all information related to the server network be edited, summarized or removed when communicating with the client nodes. Similar policy requirements exist for inter-domain LSPs and in E-NNI use case.

1.1.2. RRO Reduction

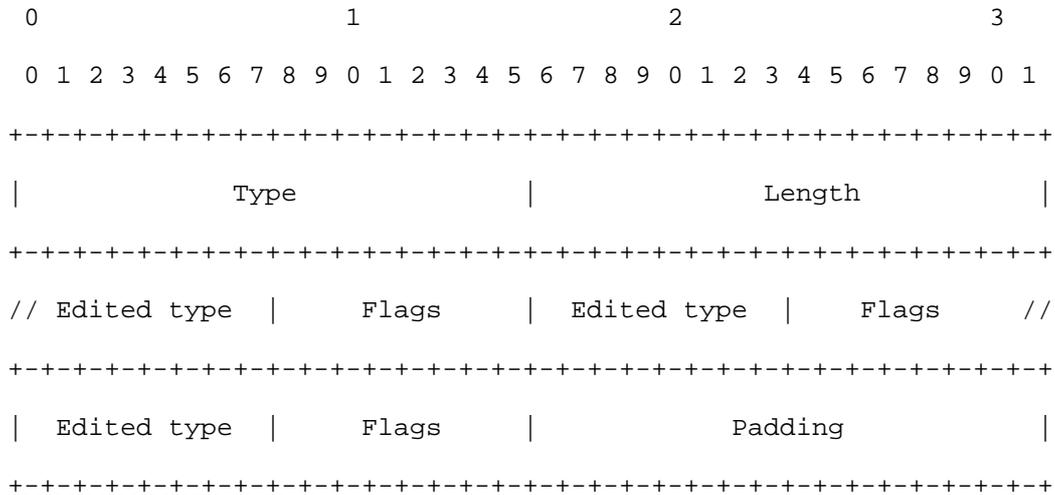
If an LSP with many hops is signaled and a great deal of information is collected at each hop, it is possible that the RRO may grow to the point where it reaches its maximum possible size or is too large to fit in the Path or Resv message. In this case a node may summarize or remove information from the RRO to reduce its size, rather than dropping it entirely as specified by [RFC-3209].

2. RSVP-TE Signaling Extensions

This section describes the signaling extensions required to address the aforementioned requirements. Specifically, the requirements are addressed by defining a new LSP_ATTRIBUTES TLV that can be used to reference what information in RRO has been edited.

2.1. RRO-edit LSP_ATTRIBUTES TLV

A new LSP_ATTRIBUTES TLV is defined in order to indicate that RRO sub-object(s) of a specified type have been edited.



The sub-object fields are defined as follows:

Type (2 bytes): The sub-object type, to be assigned by IANA (suggested value: 3).

Length (2 bytes): the total length of the TLV, in bytes. It MUST be a multiple of 4, and at least 8.

The following fields are repeated for each edited type:

Edited type (1 byte): the type of the RRO sub-object to which the immediately following flags in this sub-object apply.

Flags (1 byte): the flags that apply to the preceding Edited Type, numbered from 0 as the most significant bit in the field. Three flags are defined by this document:

- . Bit position 0: P (Partial) bit. When set, this bit indicates that the data contained in RRO sub-objects of the immediately preceding type is incomplete. This may be because some information was withheld by a node (i.e. never placed into the RRO) or because information provided by one node has been removed by another.
- . Bit position 1: S (Summary) bit. When set, this bit indicates that the data contained in the specified RRO sub-object has been summarized.

- . Bit position 2: R (Removed) bit. When set, this bit indicates that the specified RRO sub-object has been removed entirely.

The remaining bits of the Flags field are undefined. They MUST be set to 0 on transmission and MUST be ignored when received.

Padding: This field is present only if an odd number of edited type/flags pairs is present in the TLV. It is used to ensure the TLV length is always a multiple of 4 bytes.

2.2. RRO-edit TLV Processing Rules

The processing rules in this section apply to the processing of both Path and Resv RROs.

The RRO-edit TLV provides information on the changes made to RRO sub-objects. It MAY be present in the LSP_ATTRIBUTES object in a Path or Resv message. It MUST NOT be added to the LSP_REQUIRED_ATTRIBUTES object.

The LSP_ATTRIBUTES object SHOULD contain no more than one RRO-edit TLV. If a received LSP_ATTRIBUTES object contains multiple RRO-edit TLVs, the second and subsequent RRO-edit TLVs MUST be ignored.

The RRO-edit TLVs contains pairs of RRO subobject types and flags relating to that type. Any RRO subobject type MAY be present in the RRO-edit TLV. Each RRO subobject type SHOULD appear only once; if a RRO subobject type occurs more than once then only the first occurrence is meaningful, and subsequent occurrences MUST be ignored.

Normal RRO processing involves a node simply adding data related to the local hop to the RRO received from the prior node to RRO, and placing the new RRO in the message to be transmitted. In this case the transmitted RRO contains all data that was present in the received RRO and no further processing is required.

If a node edits the data in the received RRO such that the same data is not present in the transmitted RRO, or if it is supplying incomplete or summarized data on its own behalf, then the following rules apply at the processing node.

- . The node MAY choose not to add or amend the RRO-edit TLV if its local policy prevents this.
- . For each RRO subobject type that the processing node has edited, a RRO-edit type/flags pair SHOULD be added to the RRO-edit TLV if it does not already exist. If a RRO-edit type/flags

- pair for the edited subobject type is already present in the RRO-edit TLV, the node SHOULD set additional flags in that subobject if appropriate.
- . The node SHOULD set the appropriate P/S/R bits for the RRO subobject in the RRO-edit TLV to indicate the changes that have been made to RRO subobjects of that type.
 - . A node SHOULD NOT insert a RRO-edit type/flags pair with all flags set to zero.
 - . A node SHOULD NOT unset any P/S/R bit that is set in a received RRO-edit TLV.
 - . A node SHOULD NOT remove any RRO-edit type/flags pair from the RRO-edit TLV.
 - . A RRO-edit TLV with no RRO-edit type/flags pairs (i.e. one of length 4) is considered invalid. It MUST be ignored on receipt and MUST NOT be added to a LSP_ATTRIBUTES object.
 - . Unassigned flag bits are considered reserved. They MUST be set to zero.
 - . The RRO-edit TLV length MUST be a multiple of 4. If an odd number of RRO-subobject/flags pairs is present on transmission, a 16-bit Padding field MUST be added to the TLV. If an even number of RRO-subobject/flags pairs is present on transmission, the Padding MUST NOT be added. If present, the Padding bytes MUST be set to zero on transmission and MUST be ignored on receipt.
 - . Any set flag whose meaning is either unassigned or not understood SHOULD be ignored, and MUST be included unchanged in the transmitted RRO-edit TLV.
 - . A RRO-edit type/flags pair with an unknown RRO subobject type SHOULD be ignored and MUST be passed unchanged in the transmitted RRO-edit TLV.

3. Security Considerations

There are no new security considerations introduced by this document.

4. IANA Considerations

4.1. LSP_ATTRIBUTES Object

IANA has made the following assignments in the "Attributes TLV Space" section of the "RSVP-TE PARAMETERS" registry located at <http://www.iana.org/assignments/rsvp-te-parameters/rsvp-te-parameters.xml>.

This document introduces a new LSP_ATTRIBUTES sub-object:

Type	Name	Reference
TBD (suggested value: 3)	RRO-edited TLV	This I-D
This TLV is allowed on LSP_ATTRIBUTES, and not allowed on LSP_REQUIRED_ATTRIBUTES.		

5. Acknowledgments

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6. References

6.1. Normative References

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