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RSVP-TE Extensions for Collecting SRLG Information
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Abstract

This document provides extensions for the Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) to support automatic collection of Shared Risk Link Group (SRLG) Information for the TE link formed by a LSP.

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1. Introduction

It is important to understand which TE links in the network might be at risk from the same failures. In this sense, a set of links may constitute a 'shared risk link group' (SRLG) if they share a resource whose failure may affect all links in the set [RFC4202].

On the other hand, as described in [RFC4206] and [RFC6107], H-LSP (Hierarchical LSP) or S-LSP (stitched LSP) can be used for carrying one or more other LSPs. Both of the H-LSP and S-LSP can be formed as

a TE link. In such cases, it is important to know the SRLG information of the LSPs that will be used to carry further LSPs.

This document provides an automatic mechanism to collect the SRLG for the TE link formed by a LSP. Note that how to use the collected SRLG information is out of scope of this document

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].

3. RSVP-TE Requirements

3.1. SRLG Collection Indication

The ingress nodes of the LSP must be capable of indicating whether the SRLG information of the LSP should be collected during the signaling procedure of setting up an LSP. SRLG information SHOULD NOT be collected without an explicit request for it being made by the ingress node.

3.2. SRLG Collection

If requested, the SRLG information should be collected during the setup of an LSP. The endpoints of the LSP may use the collected SRLG information and use it for routing, sharing and TE link configuration purposes.

3.3. SRLG Update

When the SRLG information of an existing LSP for which SRLG information was collected during signaling changes, the relevant nodes of the LSP must be capable of updating the SRLG information of the LSP. This means that that the signaling procedure must be capable of updating the new SRLG information.

4. Encodings

4.1. SRLG Collection Flag

In order to indicate nodes that SRLG collection is desired, this document defines a new flag in the Attribute Flags TLV, which is carried in an LSP_REQUIRED_ATTRIBUTES or LSP_ATTRIBUTE Object:

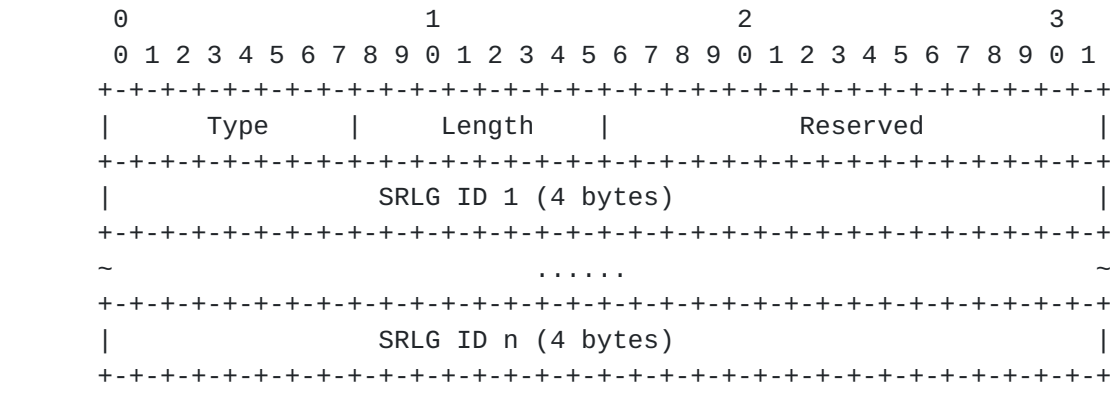
- Bit Number (to be assigned by IANA, recommended bit 12): SRLG Collection flag

The SRLG Collection flag is meaningful on a Path message. If the SRLG Collection flag is set to 1, it means that the SRLG information should be reported to the ingress and egress node along the setup of the LSP.

The rules of the processing of the Attribute Flags TLV are not changed.

4.2. SRLG sub-object

This document defines a new RRO sub-object (ROUTE_RECORD sub-object) to record the SRLG information of the LSP. Its format is modeled on the RRO sub-objects defined in RFC 3209 [RFC3209].



Type

The type of the sub-object, to be assigned by IANA, which is recommended 34.

Length

The Length field contains the total length of the sub-object in bytes, including the Type and Length fields. The Length depends on the number of SRLG IDs.

Reserved

This 2 byte field is reserved. It SHOULD be set to zero on transmission and MUST be ignored on receipt.

SRLG ID

This 4 byte field contains one SRLG ID. There is one SRLG ID field per SRLG collected.

As described in RFC 3209 [RFC3209], the RECORD_ROUTE object is managed as a stack. The SRLG sub-object SHOULD be pushed by the node before the node IP address or link identifier. The SRLG-sub-object SHOULD be pushed after the Attribute subobject, if present, and after the LABEL subobject, if requested.

A node MUST NOT push a SRLG subobject in the RECORD_ROUTE without also pushing a IPv4, IPv6 or Unnumbered Interface ID sub-object.

The rules of the processing of the LSP_REQUIRED_ATTRIBUTES, LSP_ATTRIBUTE and ROUTE_RECORD Objects are not changed.

5. Signaling Procedures

5.1. SRLG Collection

Per RFC 3209 [RFC3209], an ingress node initiates the recording of the route information of an LSP by adding a RRO to a Path message. If an ingress node also desires SRLG recording, it MUST set the SRLG Collection Flag in the Attribute Flags TLV which MAY be carried either in an LSP_REQUIRED_ATTRIBUTES Object when the collection is mandatory, or in an LSP_ATTRIBUTES Object when the collection is desired, but not mandatory

When a node receives a Path message which carries an LSP_REQUIRED_ATTRIBUTES Object and the SRLG Collection Flag set, if local policy determines that the SRLG information is not to be provided to the endpoints, it MUST return a PathErr message with Error Code 2 (policy) and Error subcode "SRLG Recording Rejected" (value to be assigned by IANA, suggest value 108) to reject the Path message.

When a node receives a Path message which carries an LSP_ATTRIBUTES Object and the SRLG Collection Flag set, if local policy determines that the SRLG information is not to be provided to the endpoints, the Path message SHOULD NOT be rejected due to SRLG recording restriction and the Path message SHOULD be forwarded without any SRLG sub-object(s) in the RRO of the corresponding outgoing Path message.

If local policy permits the recording of the SRLG information, the processing node SHOULD add local SRLG information, as defined below, to the RRO of the corresponding outgoing Path message. It then forwards the Path message to the next node in the downstream direction.

Following the steps described above, the intermediate nodes of the LSP can collect the SRLG information in the RRO during the processing

of the Path message hop by hop. When the Path message arrives at the egress node, the egress node receives SRLG information in the RRO.

Per RFC 3209 [RFC3209], when issuing a Resv message for a Path message which contains an RRO, an egress node initiates the RRO process by adding an RRO to the outgoing Resv message. The processing for RROs contained in Resv messages then mirrors that of the Path messages.

When a node receives a Resv message for an LSP for which SRLG Collection is specified, if local policy determines that the SRLG information is not to be provided to the endpoints, if the SRLG-recording request was in a LSP_REQUIRED_ATTRIBUTES object, then a ResvErr with Error code 2 (policy) and Error subcode "SRLG Recording Rejected" (value to be assigned by IANA, suggest value 108) MUST be sent. If the request was in a LSP_ATTRIBUTES object, then a ResvErr SHOULD NOT be generated, but SRLG information MUST NOT be added in the RRO. When local policy allows recording SRLG information, the node SHOULD add SRLG information, as defined below, to the RRO of the corresponding outgoing Resv message. When the Resv message arrives at the ingress node, the ingress node can get the SRLG information from the RRO in the same way as the egress node.

Note that a link's SRLG information for the upstream direction cannot be assumed to be the same as that in the downstream.

- For Path and Resv messages for a unidirectional LSP, a node SHOULD include SRLG sub-objects in the RRO for the downstream data link only.

- For Path and Resv messages for a bidirectional LSP, a node SHOULD include SRLG sub-objects in the RRO for both the upstream data link and the downstream data link from the local node. In this case, the node MUST include the information in the same order for both Path messages and Resv messages. That is, the SRLG sub-object for the upstream link is added to the RRO before the SRLG sub-object for the downstream link.

Based on the above procedure, the endpoints can get the SRLG information automatically. Then the endpoints can for instance advertise it as a TE link to the routing instance based on the procedure described in [RFC6107] and configure the SRLG information of the FA automatically.

5.2. SRLG Update

When the SRLG information of a link is changed, the LSPs using that link should be aware of the changes. The procedures defined in Section 4.4.3 of RFC 3209 [RFC3209] MUST be used to refresh the SRLG information if the SRLG change is to be communicated to other nodes according to the local node's policy. If local policy is that the SRLG change should be suppressed or would result in no change to the previously signaled SRLG-list, the node SHOULD NOT send an update.

5.3. Compatibility

A node that does not recognize the SRLG Collection Flag in the Attribute Flags TLV is expected to proceed as specified in RFC 5420 [RFC5420]. It is expected to pass the TLV on unaltered if it appears in a LSP_ATTRIBUTES object, or reject the Path message with the appropriate Error Code and Value if it appears in a LSP_REQUIRED_ATTRIBUTES object.

A node that does not recognize the SRLG RRO sub-object is expected to behave as specified in RFC 3209 [RFC3209]: unrecognized subobjects are to be ignored and passed on unchanged.

6. Manageability Considerations

6.1. Policy Configuration

In a border node of inter-domain or inter-layer network, the following SRLG processing policy should be capable of being configured:

- Whether the SRLG IDs of the domain or specific layer network can be exposed to the nodes outside the domain or layer network, or whether they should be summarized, mapped to values that are comprehensible to nodes outside the domain or layer network, or removed entirely.

6.2. Coherent SRLG IDs

In a multi-layer multi-domain scenario, SRLG ids may be configured by different management entities in each layer/domain. In such scenarios, maintaining a coherent set of SRLG IDs is a key requirement in order to be able to use the SRLG information properly. Thus, SRLG IDs must be unique. Note that current procedure is targeted towards a scenario where the different layers and domains belong to the same operator, or to several coordinated administrative groups. Ensuring the aforementioned coherence of SRLG IDs is beyond the scope of this document.

Further scenarios, where coherence in the SRLG IDs cannot be guaranteed are out of the scope of the present document and are left for further study.

7. Security Considerations

This document does not introduce any additional security issues above those identified in [RFC5920][RFC3209][RFC3473]

8. IANA Considerations

8.1. RSVP Attribute Bit Flags

IANA has created a registry and manages the space of attributes bit flags of Attribute Flags TLV, as described in section 11.3 of [RFC5420], in the "Attributes TLV Space" section of the "Resource Reservation Protocol-Traffic Engineering (RSVP-TE) Parameters" registry located in https://www.iana.org/assignments/rsvp-te-parameters/rsvp-te-parameters.xhtml. It is requested that IANA makes assignments from the Attribute Bit Flags.

This document introduces a new Attribute Bit Flag:

- Bit number: TBD (10)
- Defining RFC: this I-D
- Name of bit: SRLG Collection Flag
- The meaning of the SRLG Collection Flag is defined in this I-D.

8.2. ROUTE_RECORD Object

IANA has made the following assignments in the "Class Names, Class Numbers, and Class Types" section of the "RSVP PARAMETERS" registry located at http://www.iana.org/assignments/rsvp-parameters. We request that IANA make assignments from the ROUTE_RECORD RFC 3209 [RFC3209] portions of this registry.

This document introduces a new RRO sub-object:

Type	Name	Reference
TBD (34)	SRLG sub-object	This I-D

8.3. Policy Control Failure Error subcodes

IANA has made the following assignments in the "Error Codes and Globally-Defined Error Value Sub-Codes" section of the "RSVP PARAMETERS" registry located at http://www.iana.org/assignments/rsvp-parameters. We request that IANA make assignments from the Policy Control Failure Sub-Codes registry.

This document introduces a new Policy Control Failure Error sub-code:

- Error sub-code: TBD (108)
- Defining RFC: this I-D
- Name of error sub-code: SRLG Recording Rejected
- The meaning of the SRLG Recording Rejected error sub-code is defined in this I-D

9. Acknowledgements

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10. References

10.1. Normative References

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