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PCEP Extensions for Receiving SRLG Information
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Abstract

The Path Computation Element (PCE) provides functions of path computation in support of traffic engineering in networks controlled by Multi-Protocol Label Switching (MPLS) and Generalized MPLS (GMPLS).

This document provides extensions for the Path Computation Element Protocol (PCEP) to support collection of Shared Risk Link Group (SRLG) information during path computation and encoding this information in the reply message.

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1. Introduction

As per [RFC4655], PCE based path computation model is deployed in large, multi-domain, multi-region, or multi-layer networks. In such case PCEs may cooperate with each other to provide end to end optimal path.

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]. H-LSP (Hierarchical LSP) or S-LSP (Stitched LSP) can be used for carrying one or more other LSPs as described in [RFC4206] and [RFC6107]. H-LSP and S-LSP may be computed by PCE(s) and further form as a TE

link. The SRLG information of such LSPs can be collected during path computation itself and encoded in the PCEP Path Computation Reply (PCRep) message. [I-D.zhang-ccamp-gmpls-uni-app] describes the use of PCE for end to end User-Network Interface (UNI) path computation.

[I-D.farrel-interconnected-te-info-exchange] describes a scaling problem with SRLGs in multi-layer environment and introduce a concept of Macro SRLG. Lower layer SRLG collection at the time of path computation can be used to generate such a Macro SRLG at the PCE.

Note that [I-D.ietf-ccamp-rsvp-te-srlg-collect] specifies a similar extension to Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) where SRLG information is collected at the time of signaling.

1.1. 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 [RFC2119].

2. Terminology

The following terminology is used in this document.

CPS: Confidential Path Segment. A segment of a path that contains nodes and links that the policy requires not to be disclosed outside the domain.

PCE: Path Computation Element. An entity (component, application, or network node) that is capable of computing a network path or route based on a network graph and applying computational constraints.

SRLG: Shared Risk Link Group.

UNI: User-Network Interface.

3. PCEP Requirements

Following key requirements are identified for PCEP to enable SRLG information collection during path computation:

SRLG Collection Indication: The PCEP speaker must be capable of indicating whether the SRLG information of the LSP should be collected during the path computation procedure.

SRLG Collection: If requested, the SRLG information should be collected during the path computation and encoded in the PCRep message.

4. Extension to PCEP

This document extends the existing RP (Request Parameters) object [RFC5440] so that a PCEP speaker can request SRLG information collection during path computation. The SRLG subobject maybe carried inside the Explicit Route Object (ERO) in the PCRep message.

4.1. The Extension of the RP Object

This document adds the following flags to the RP Object:

S (SRLG - 1 bit): when set, in a PCReq message, this indicates that the SRLG information of the Label switched path (LSP) should be collected during the path computation procedure. Otherwise, when cleared, this indicates that the SRLG information should not be collected. In a PCRep message, when the S bit is set this indicates that the returned path in ERO also carry the SRLG information; otherwise (when the S bit is cleared), the returned path does not carry SRLG information.

4.2. SRLG Subobject in ERO

As per [RFC5440], ERO is used to encode the path of a TE LSP and is carried within a PCRep message to provide the computed path when computation was successful.

The SRLG of a path is the union of the SRLGs of the links in the LSP [RFC4202]. The SRLG subobject is defined in [I-D.ietf-ccamp-rsvp-te-srlg-collect], as shown below:

```

      0                               1                               2                               3
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-----+-----+-----+-----+-----+-----+-----+-----+
|          Type          |          Length          |   Reserved   |   Flags   |
+-----+-----+-----+-----+-----+-----+-----+-----+
|          SRLG ID 1 (4 bytes)          |
+-----+-----+-----+-----+-----+-----+-----+-----+
~                               .....                               ~
+-----+-----+-----+-----+-----+-----+-----+-----+
|          SRLG ID n (4 bytes)          |
+-----+-----+-----+-----+-----+-----+-----+-----+

```

The meaning and description of Type, Length and SRLG ID can be found in [I-D.ietf-ccamp-rsvp-te-srlg-collect]. Bits in the Flags field is ignored.

The SRLG subobject should be encoded inside the ERO object in the PCRep message when the S-Bit (SRLG) is set in the PCReq message.

5. Other Considerations

5.1. Backward Compatibility

If a PCE receives a request and the PCE does not understand the new SRLG flag in the RP object, then the PCE SHOULD reject the request.

If PCEP speaker receives a PCRep message with SRLG subobject that it does not support or recognize, it must act according to the existing processing rules.

5.2. Confidentiality via PathKey

[RFC5520] defines a mechanism to hide the contents of a segment of a path, called the Confidential Path Segment (CPS). The CPS may be replaced by a path-key that can be conveyed in the PCEP and signaled within in a RSVP-TE ERO.

When path-key confidentiality is used, collection of SRLG information and encoding this information in PCRep along with the path-key could be useful to compute a SRLG disjoint backup path at the later instance.

6. Security Considerations

TBD.

7. Manageability Considerations

7.1. Control of Function and Policy

TBD.

7.2. Information and Data Models

TBD.

7.3. Liveness Detection and Monitoring

TBD.

7.4. Verify Correct Operations

TBD.

7.5. Requirements On Other Protocols

TBD.

7.6. Impact On Network Operations

TBD.

8. IANA Considerations

IANA assigns values to PCEP parameters in registries defined in [RFC5440]. IANA is requested to make the following additional assignments.

8.1. New Subobjects for the ERO Object

IANA has previously assigned an Object-Class and Object-Type to the ERO carried in PCEP messages [RFC5440]. IANA also maintains a list of subobject types valid for inclusion in the ERO.

IANA is requested to assign one new subobject types for inclusion in the ERO as follows:

Subobject Meaning	Reference
34 (TBD) SRLG sub-object	This document

9. Acknowledgments

TBD.

10. References

10.1. Normative References

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