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PCEP Extensions to Support Signaling Candidate Path Threshold Constraints of SR Policy

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Status of this Memo

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Abstract

This document defines the extensions of PCEP to signal the threshold and metric constraint parameters of candidate paths for SR Policy to support flexible path selection.

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1. Introduction

Segment routing (SR) [RFC8402] is a source routing paradigm that explicitly indicates the forwarding path for packets at the ingress node. The ingress node steers packets into a specific path according to the Segment Routing Policy (SR Policy) as defined in [RFC9256]. An SR Policy may have multiple candidate paths that are provisioned or signaled [I-D.ietf-idr-sr-policy-safi] [RFC8664] from one of more sources.

[I-D.liu-spring-sr-policy-flexible-path-selection] proposes a flexible SR policy candidate path selection method. Based on the real-time resource usage and forwarding quality of candidate paths, the head node can perform dynamic path switching among multiple candidate paths in the SR policy. Multiple threshold parameters for SR Policy candidate path selection are listed in Section 4.1 of [I-D.liu-spring-sr-policy-flexible-path-selection].

PCEP Extensions for Segment Routing [RFC8664] specifies extensions that allow PCEP to work with basic SR-TE paths.

PCEP extension to support Segment Routing Policy Candidate Paths [I-D.ietf-pce-segment-routing-policy-cp] specifies extensions that allow PCEP to signal additional attributes of an SR Policy, which are not covered by [RFC8664]. SR Policy is modeled in PCEP as an Association and the SR Candidate Paths are the members of that Association. Thus, the PCE can take computation and control decisions about the Candidate Paths, with the additional knowledge that these Candidate Paths belong to the same SR Policy.

This document defines PCEP extensions to signal threshold and metric constraint parameters of candidate path (CP) for an SR Policy.

2. Terminology

The definitions of the basic terms are identical to those found in Segment Routing Policy Architecture [RFC9256].

3. PCEP Extensions

As defined in [RFC8697], TE LSPs are associated by adding them to a common association group by PCEP peer. [I-D.ietf-pce-segment-routing-policy-cp] defines SR Policy Association (SRPA), and the SR Candidate Paths are the members of this Association. This document defines the following two TLVs for PCE to signal threshold and metric constraint parameters for candidate paths to PCC.

* SR Bandwidth Constraint TLV

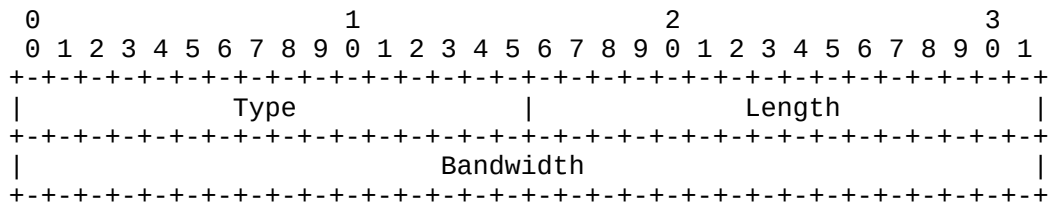
* SR Metric Constraint TLV

3.1. SR Bandwidth Constraint TLV

The SR Bandwidth Constraint TLV is used to carry the bandwidth threshold constraint parameter of a candidate path.

The SR Bandwidth Constraint TLV is an optional TLV for the SRPA object.

The format of the SR Bandwidth Constraint TLV is defined as follows:



where:

- Type: to be assigned by IANA

- Length: Specifies the length of the value field. The value MUST be 4.

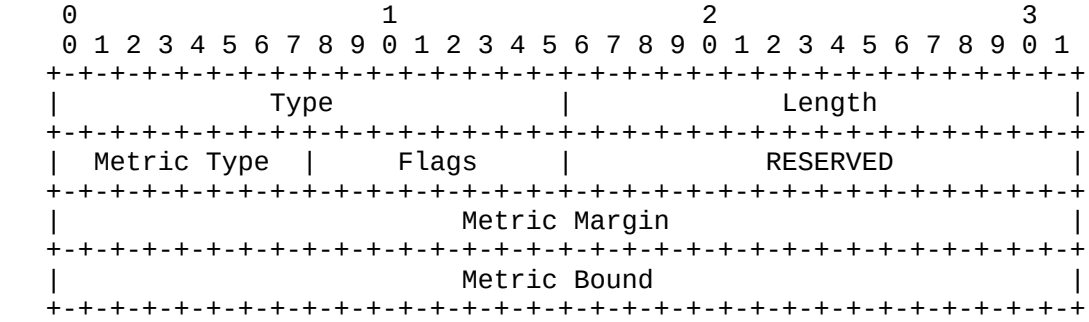
- Bandwidth: 4 octets which specify the bandwidth threshold in unit of bytes per second in IEEE floating point format.

3.2. SR Metric Constraint TLV

The SR Metric Constraint TLV is used to carry the metric Constraint of a candidate path.

The SR Metric Constraint TLV is an optional TLV for the SRPA object.

The format of the SR Metric Constraint Sub-TLV is defined as follows:



where:

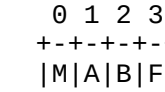
- Type: to be assigned by IANA

- Length: Specifies the length of the value field. The value MUST be 12.

- Metric Type: 1-octet field which identifies the type of the metric being used. The metric type code points are as follows:

  * 0: Bandwidth threshold in bytes per second.
  * 1: Weight threshold.
  * 2: Real-time bandwidth threshold in bytes per second.
  * 3: Round trip delay threshold in microseconds.
  * 4: Round trip loss threshold. The unit is 0.000003%.

- Flags: 1-octet field that indicates the validity of the metric fields and their semantics. The following bit positions are defined and the other bits MUST be cleared by the originator and MUST be ignored by a receiver.



where:

  * M-Flag: Indicates that the metric margin allowed is specified when set.
  * A-Flag: Indicates that the metric margin is specified as an absolute value when set and is expressed as a percentage of the metric when clear.
  * B-Flag: Indicates that the metric bound allowed for the

path is specified when set.

* F-Flag: Indicates that the Metric Margin and Metric Bound are floating-point numbers when set to 1. When set to 0, it indicates they are integer numbers.

- Metric Margin: 4-octet value which indicates the minimum threshold when the M-flag is set. The metric margin is specified as either an absolute value or as a percentage of the path metric based on the A-Flag.

- Metric Bound: 4-octet value which indicates the maximum threshold that is allowed when the B-flag is set. If the path metric crosses the specified bound value then the path is considered invalid.

- RESERVED: 1 octet of reserved bits. SHOULD be set to zero on transmission and MUST be ignored on receipt.

4. IANA Considerations

This document defines the new TLVs for carrying additional information about SR Policy and SR Candidate Paths. IANA is requested to make the assignment of new allocations in the existing "PCEP TLV Type Indicators" sub-registry as follows:

Value	Description	Reference
TBA1	SR Bandwidth Constraint TLV	This document
TBA2	SR Metric Constraint TLV	This document

5. Security Considerations

[I-D.ietf-pce-segment-routing-policy-cp] has discussed the security considerations for distributing SR Policy through PCEP. This document does not introduce any new security issues.

6. References

6.1. Normative References

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6.2. Informative References

TBD

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