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PCEP extensions for Circuit Style Policies

Abstract

This document proposes a set of extensions for Path Computation Element Communication Protocol (PCEP) for Circuit Style Policies - Segment-Routing Policy designed to satisfy requirements for connection-oriented transport services. New TLV is introduced to control path recomputation triggers and new flag to add ability to request path with strict hops only.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

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1. Introduction

Usage of Segment-routing and PCEP in connection-oriented transport services require path persistency and hop-by-hop behavior for PCE computed paths.

Circuit-Style Policy introduced in [[I-D.schmutzer-pce-cs-sr-policy](#)] requires PCEP extensions, which are covered in this document.

This document:

- *Introduces possibility to request strict path from the PCE by extending LSP-EXTENDED-FLAG TLV

*Adding new TLV for encoding blocked path recomputation triggers to the PCE is introduced, to be carried inside the LSP object, which is defined in [[RFC8231](#)].

*Clarifies usage of existing O-flag from RP object in Segment-routing

PCEP extensions described in this document are applicable to RSVP-TE and SR-TE.

2. Terminology

The following terminologies are used in this document:

ERO: Explicit Route Object

IGP: Interior Gateway Protocol

LSP: Label Switched Path.

LSPA: Label Switched Path Attributes.

OTN: Optical Transport Network.

PCC: Path Computation Client

PCE: Path Computation Element

PCEP: Path Computation Element Protocol.

SDH: Synchronous Digital Hierarchy

SID: Segment Identifier

SONET: Synchronous Optical Network

SR: Segment Routing.

SR-TE: Segment Routing Traffic Engineering.

3. Overview of Extensions to PCEP

3.1. LSP-EXTENDED-FLAG TLV

O-flag is proposed in the LSP-EXTENDED-FLAG TLV, which was introduced in 5.1.2 of [[I-D.ietf-pce-lsp-extended-flags](#)] and extended with E-flag in [[I-D.peng-pce-entropy-label-position](#)]

The format of the LSP-EXTENDED-FLAG is as follows:

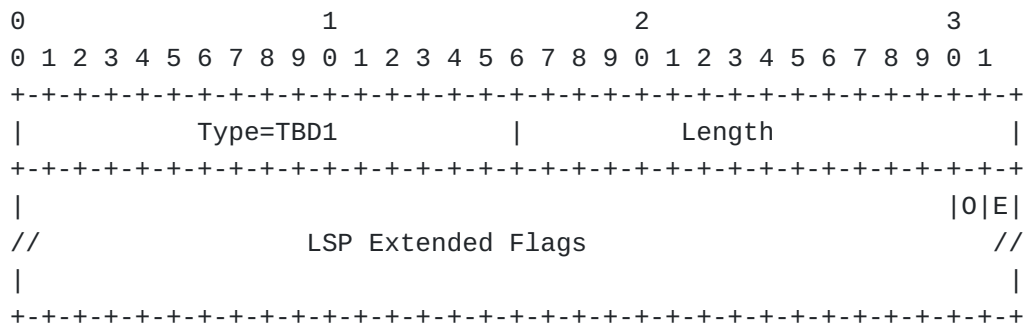


Figure 1: LSP-EXTENDED-FLAG TLV Format

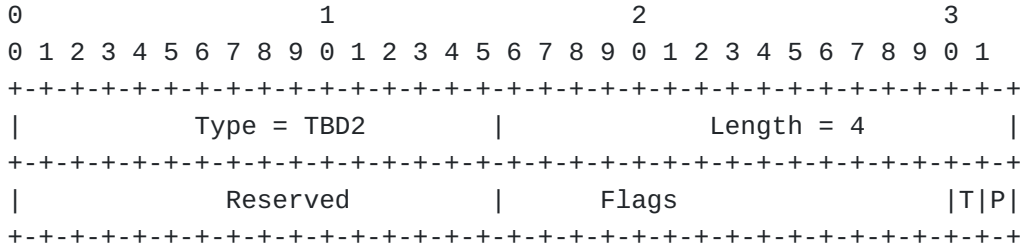
Type (16 bits): the value is TBD1 by IANA.

Length (16 bits): multiple of 4 octets.

0 (Strict-Path): If set to 1, this indicates to the PCE that a path exclusively made of strict hops is required. Strict hop definition can be found in Section 4.1

3.2. RECOMPUTATION-TRIGGERS TLV

This document defines new TLV for the LSP Object for encoding information about blocked path recomputation triggers.



Type (16 bits): the value is TBD2 by IANA.

Length (16 bits): 4 octets

Reserved: MUST be set to zero by the sender and MUST be ignored by the receiver.

Flags: This document defines the following flag bits. The other bits MUST be set to zero by the sender and MUST be ignored by the receiver.

*T (Topology-change): If set to 1, the PCE MUST NOT trigger recomputation as a result of received updated topology information.

*P (Periodic-timer): If set to 1, the PCE MUST NOT trigger recomputation based on any periodic timer.

4. Operation

4.1. Strict path enforcement

PCC MAY set the 0 flag in LSP-EXTENDED-FLAG TLV in PCRpt message to the PCE to indicate that a path exclusively made of strict hops is required.

0 flag cleared or LSP-EXTENDED-FLAG TLV not included indicates that a loose path is acceptable.

In PCUpdate or PCInitiate messages, when the 0 bit is set, this indicates that strict path is provided.

The flag is applicable only for stateful messages. Existing 0 flag in RP object MAY be used to indicate similar behavior in PCReq and PCRep messages as described in as described in Section 7.4.1 of [[RFC5440](#)].

If 0 flag is set to 1 for both stateful and stateless messages for SR paths introduced in [[RFC8664](#)], the PCE MUST use Adjacency SIDs only.

4.2. Path computation triggers

PCC MAY set flags in RECOMPUTATION-TRIGGERS-TLV to block specific triggers. If TLV is not included or all flags are set to 0, then the PCE MAY use any event to start path computation.

Disabled recomputation triggered by topology event is not blocking path computation started based PCRpt or based on updated state of associated LSP.

If trigger blocked by specific flag is not supported or allowed on the PCE, then PCE MAY ignore received flag value. The PCE SHOULD reflect blocked triggers in PCUpdate message.

TLV MAY be included in PCInitiate and PCUpdate messages to indicate, which triggers will be disabled on the PCE. PCC should reflect flag values in PCRpt messages to forward requirement to other PCEs in the network.

5. Security Considerations

No additional security measure is required.

6. IANA Considerations

6.1. LSP-EXTENDED-FLAG TLV

[I-D.ietf-pce-lsp-extended-flags] defines the LSP-EXTENDED-FLAG TLV. IANA is requested to make the following assignment from the "LSP-EXTENDED-FLAG TLV Flag Field" registry:

Bit	Description	Reference
TBD1	Strict-Path Flag (0)	This document

Table 1

6.2. RECOMPUTATION-TRIGGERS TLV

IANA is requested to make the assignment of a new value for the existing "PCEP TLV Type Indicators" registry as follows:

TLV Type	TLV Name	Reference
TBD2	RECOMPUTATION-TRIGGERS TLV	This document

Table 2

7. References

7.1. Normative References

[I-D.ietf-pce-lsp-extended-flags]

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[I-D.peng-pce-entropy-label-position] Xiong, Q., Peng, S., and F.

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[RFC5440] Vasseur, JP., Ed. and JL. Le Roux, Ed., "Path Computation Element (PCE) Communication Protocol (PCEP)", RFC 5440, DOI 10.17487/RFC5440, March 2009, <<https://www.rfc-editor.org/info/rfc5440>>.

[RFC8174]

Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

[RFC8231]

Crabbe, E., Minei, I., Medved, J., and R. Varga, "Path Computation Element Communication Protocol (PCEP) Extensions for Stateful PCE", RFC 8231, DOI 10.17487/RFC8231, September 2017, <<https://www.rfc-editor.org/info/rfc8231>>.

[RFC8664]

Sivabalan, S., Filsfils, C., Tantsura, J., Henderickx, W., and J. Hardwick, "Path Computation Element Communication Protocol (PCEP) Extensions for Segment Routing", RFC 8664, DOI 10.17487/RFC8664, December 2019, <<https://www.rfc-editor.org/info/rfc8664>>.

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[I-D.schmutzer-pce-cs-sr-policy] Schmutzer, C., Filsfils, C., Ali, Z., and F. Clad, "Circuit Style Segment Routing Policies", Work in Progress, Internet-Draft, draft-schmutzer-pce-cs-sr-policy-00, 30 September 2021, <<https://www.ietf.org/archive/id/draft-schmutzer-pce-cs-sr-policy-00.txt>>.

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