Path Computation Element communication Protocol extension for associating Policies and LSPs
draft-ietf-pce-association-policy-01

Abstract

This document introduces a simple mechanism to associate policies to a group of Label Switched Paths (LSPs) via an extension to the Path Computation Element (PCE) Communication Protocol (PCEP).

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1.  Introduction

[RFC5440] describes the Path Computation Element communication Protocol (PCEP) which enables the communication between a Path Computation Client (PCC) and a Path Control Element (PCE), or between two PCEs based on the PCE architecture [RFC4655].

PCEP Extensions for Stateful PCE Model [I-D.ietf-pce-stateful-pce] describes a set of extensions to PCEP to enable active control of MPLS-TE and GMPLS tunnels. [I-D.ietf-pce-pce-initiated-lsp] describes the setup and teardown of PCE-initiated LSPs under the active stateful PCE model, without the need for local configuration on the PCC, thus allowing for a dynamic network. Currently, the LSPs can either be signaled via RSVP-TE or can be segment routed as specified in [I-D.ietf-pce-segment-routing].
[I-D.ietf-pce-association-group] introduces a generic mechanism to create a grouping of LSPs which can then be used to define associations between a set of LSPs and a set of attributes (such as configuration parameters or behaviors) and is equally applicable to stateful PCE (active and passive modes) and stateless PCE.

This document specifies a PCEP extension to associate one or more LSPs with policies using the generic association mechanism.

A PCEP speaker may want to influence the PCEP peer with respect to path selection and other policies. This document describes a PCEP extension to associate policies by creating Policy Association Group (PAG) and encoding this association in PCEP messages. The specification is applicable to both stateful and stateless PCEP sessions.

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.

LSR: Label Switch Router.

MPLS: Multiprotocol Label Switching.

PAG: Policy Association Group.

PCC: Path Computation Client. Any client application requesting a path computation to be performed by a Path Computation Element.

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.


3. Motivation

Paths computed using PCE MAY be subjected to various policies on both PCE and PCC. For example, in a centralized traffic engineering scenario, network operators may instantiate LSPs and specifies policies for traffic steering, path monitoring, etc., for some LSPs
via the stateful PCE. Similarly, a PCC may request a user- or service-specific policy to be applied at the PCE, such as constraints relaxation to meet optimal QoS and resiliency.

PCEP speaker can use the generic mechanism as per [I-D.ietf-pce-association-group] to associate a set of LSPs with policy, without the need to know the details of such policies, which simplifies network operations, avoids frequent software upgrades, as well provides an ability to introduce new policy faster.

PAG Y
(Service-Specific Policy for constraint relaxation)

Initiate & Monitor LSP

<table>
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| PCC |-----( (G)MPLS network ) |
|------|

| PCC2 |-------( )|
|------|

| Monitor LSP |'--( )--' |
|-------------|

| '----' |

Case 1: Policy requested by PCE and enforced by PCC

Case 2: Policy requested by PCC and enforced by PCE

Sample use-cases for carrying policies over PCEP session
3.1. Policy based Constraints

In the context of policy-enabled path computation [RFC5394], path computation policies may be applied at both a PCC and a PCE. Consider an Label Switch Router (LSR) with a policy enabled PCC, it receives a service request via signaling, including over a Network-Network Interface (NNI) or User Network Interface (UNI) reference point, or receives a configuration request over a management interface to establish a service. The PCC may also apply user- or service-specific policies to decide how the path selection process should be constrained, that is, which constraints, diversities, optimization criterion, and constraint relaxation strategies should be applied in order for the service LSP(s) to have a likelihood to be successfully established and provide necessary QoS and resilience against network failures. The user- or service-specific policies applied to PCC and are then passed to the PCE along with the Path computation request, in the form of constraints [RFC5394].

PCEP speaker can use the generic mechanism as per [I-D.ietf-pce-association-group] to associate a set of LSPs with policy and its resulting path computation constraints. This simplified the path computation message exchanges.

4. Overview

As per [I-D.ietf-pce-association-group], LSPs are associated with other LSPs with which they interact by adding them to a common association group. Grouping can also be used to define association between LSPs and policies associated to them. One new Association Type is defined in this document, based on the generic Association object -

- Association type = TBD1 ("Policy Association Type") for Policy Association Group (PAG)

This Association-Type is operator-configured association in nature and created by the operator manually on the PCEP peers. The LSP belonging to this associations is conveyed via PCEP messages to the PCEP peer. Operator-configured Association Range SHOULD NOT be set for this association-type, and MUST be ignored, so that the full range of association identifier can be utilized.

A PAG can have one or more LSPs and its associated policy(s). The association identifier, type (Policy), as well as the association source IP address is manually configured by the operator and is used to identify the PAG.
As per the processing rules, as specified in section 5.3 of [I-D.ietf-pce-association-group], if a PCEP speaker does not support this Policy association-type, it MUST return a PCErr message with Error-Type TBD "Association Error" and Error-Value 1 "Association-type is not supported". Since the PAG is opaque in nature, the PAG and the policy MUST be set on the PCEP peers. If a PCE speaker receives PAG in a PCEP message, and the association information is not configured, it MUST return a PCErr message with Error-Type TBD "Association Error" and Error-Value 4 "Association unknown". All other processing is as per section 5.3 of [I-D.ietf-pce-association-group].

5. Policy Association Group

Association groups and their memberships are defined using the ASSOCIATION object defined in [I-D.ietf-pce-association-group]. Two object types for IPv4 and IPv6 are defined. The ASSOCIATION object includes "Association type" indicating the type of the association group. This document adds a new Association type -

Association type = TBD1 ("Policy Association Type") for PAG.

PAG may carry optional TLVs including but not limited to -

- VENDOR-INFORMATION-TLV: Used to communicate arbitrary vendor specific behavioral information, described in [RFC7470].

6. Security Considerations

This document defines one new type for association, which do not add any new security concerns beyond those discussed in [RFC5440], [I-D.ietf-pce-stateful-pce] and [I-D.ietf-pce-association-group] in itself.

Some deployments may find policy associations and their implications as extra sensitive and thus should employ suitable PCEP security mechanisms like [I-D.ietf-pce-pceps].

7. IANA Considerations

7.1. Association object Type Indicators

This document defines the following new association type originally defined in [I-D.ietf-pce-association-group].

<table>
<thead>
<tr>
<th>Value</th>
<th>Name</th>
<th>Reference</th>
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<tbody>
<tr>
<td>TBD1</td>
<td>Policy Association Type</td>
<td>[This I.D.]</td>
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8. Manageability Considerations

8.1. Control of Function and Policy

An operator MUST BE allowed to configure the policy associations at PCEP peers and associate it with the LSPs.

8.2. Information and Data Models

[RFC7420] describes the PCEP MIB, there are no new MIB Objects for this document.

8.3. Liveness Detection and Monitoring

Mechanisms defined in this document do not imply any new liveness detection and monitoring requirements in addition to those already listed in [RFC5440].

8.4. Verify Correct Operations

Mechanisms defined in this document do not imply any new operation verification requirements in addition to those already listed in [RFC5440].

8.5. Requirements On Other Protocols

Mechanisms defined in this document do not imply any new requirements on other protocols.

8.6. Impact On Network Operations

Mechanisms defined in this document do not have any impact on network operations in addition to those already listed in [RFC5440].

9. Acknowledgments

A special thanks to author of [I-D.ietf-pce-association-group], this document borrow some of the text from it.

10. References

10.1. Normative References

10.2. Informative References


[I-D.ietf-pce-pce-initiated-lsp]

[I-D.ietf-pce-segment-routing]
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