           Ability for a stateful PCE to request and obtain control of LSP
                 draft-raghu-pce-lsp-control-request-00.txt

Abstract

   The stateful PCEP extensions provide stateful control of
   Multiprotocol Label Switching (MPLS) Traffic Engineering Label
   Switched Paths (TE LSP) via PCEP, for a model where a PCC delegates
   control over one or more locally configured LSPs to a stateful PCE.
   There are use-cases in which a stateful PCE may wish to request and
   obtain control of one or more LSPs from a PCC. This document
   describes a simple extension to stateful PCEP to achieve such
   objective.

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].

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1. Introduction

   Stateful PCEP extensions [I-D.ietf-pce-stateful-pce] specifies a set
   of extensions to PCEP to enable stateful control of TE LSPs between
   and across PCEP sessions in compliance with [RFC4657]. It includes
   mechanisms to effect LSP state synchronization between PCCs and PCEs,
   delegation of control of LSPs to PCEs, and PCE control of timing and
   sequence of path computations within and across PCEP sessions. The
   stateful PCEP defines the following two useful network operations:

   o Delegation: an operation in which a PCC temporarily grants the
      rights to modify one or more LSPs to a PCE, and such LSPs are
      referred to as delegated LSPs.

   o Revocation: an operation in which a PCC revokes the previously
      granted rights to modify one or more LSPs from a PCE.

   Some network operators prefer head-end (PCC) based reactivity to
   network events (e.g., link failure). For example, typically
   operators would like to reduce the time that backup LSP are being
   used for fast-reroute protection as the links that a backup LSP

traverses may be congested when fast-reroute is active. PCC based
LSP failure detection and re-routing mechanisms enable operators to
minimize the duration of such congestion and meet operational
requirements/constraints. As such, during normal operations, it may
be preferable for PCC to have full control of its LSPs. However,
operators shall prefer to use PCE for planned events such as
centralized optimization and placement of LSPs. In this case, it is
preferable for a PCE to obtain the control of one or more LSPs from a
PCC, rather than waiting for the PCC to delegate the control. Once
the PCE completes its operation, it reliqushes the control of the
LSPs. Such capability enables operatirs to combine the benefits of
both centralized and distributed control of TE LSPs to get the best
of both worlds.

This specification provides a simple extension using which a PCE can
request control of one or more LSPs from any PCC over stateful PCEP
channel. The procedures for granting and relinquishing control of
the LSPs are specified in accordance with the specification
[I-D.ietf-pce-stateful-pce].

2. Terminology

The following terminologies are used in this document:

PCC: Path Computation Client.

PCE: Path Computation Element

PCEP: Path Computation Element Protocol.

PCRpt: PCEP report message.

PCUpd: PCEP update message.

PLSP-ID: A PCEP-specific identifier for the LSP.

3. LSP Control Request Flag

The LSP object is defined in [I-D.ietf-pce-stateful-pce] and
included here for ease of reference.

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             PLSP-ID               |Flags|G|C|   O|A|R|S|D|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                           TLVs                                |
~                                                              ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
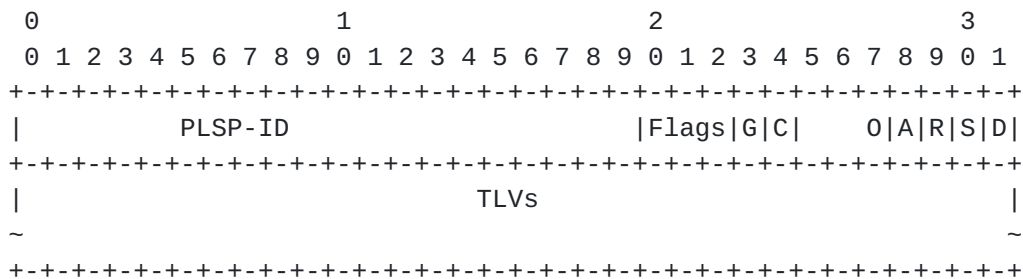
Figure 1: The LSP Object

A new flag, the "LSP Control Request Flag" (G), is introduced. On a
PCUpd message, a PCE sets the G Flag to 1 to indicate that it wishes
to gain control of LSP(s). A PLSP-ID of value other than 0 and
0xFFFFF is used to identify the LSP for which the PCE requests
control. The PLSP-ID value of 0 indicates that the PCE is requesting
control of all LSPs originating from the PCC.

4. Operation

During normal operation, a PCC that wishes to delegate the control of
an LSP sets the D Flag to 1 in all PCRpt messages pertaining to the
LSP. The PCE confirms the delegation by setting D Flag to 1 in all
PCUpd messages pertaining to the LSP. The PCC revokes the control of
the LSP from the PCE by setting D Flag to 0 in PCRpt messages
pertaining to the LSP. If the PCE wishes to relinquish the control
of the LSP, it sets D Flag to 0 in all PCUpd messages pertaining to
the LSP.

If a PCE wishes to gain control over an LSP, it sends a PCUpd message
with G Flag set to 1. The LSP for which the PCE requests control is
identified by the PLSP-ID. The PLSP-ID of 0 indicates that the PCE
wants control over all LSPs originating from the PCC. If the LSP(s)
is/are already delegated to the PCE, the PCC ignores the G Flag. A
PCC can decide to delegate the control of the LSP at its own
discretion. If the PCC grants or denies the control, it sends PCRpt
message with D Flag set to 1 and 0 respectively in accordance with
according with stateful PCEP [I-D.ietf-pce-stateful-pce] . If the PCC
does not grant the control, the PCE may choose to retry requesting
the control preferably using exponentially increasing timer. A PCE
ignores the G Flag on PCRpt message

In case multiple PCEs request control over an LSP, and if the PCC is
willing to grant the control, the LSP MUST be delegated to only one
PCE chosen by the PCC based on its local policy.

5. Security Considerations

No additional security measure is required.

6. IANA Considerations

None.

7. Acknowledgements

TBD.

8. Normative References

[I-D.ietf-pce-stateful-pce]
          Crabbe, E., Minei, I., Medved, J., and R. Varga, "PCEP
          Extensions for Stateful PCE", draft-ietf-pce-stateful-
          pce-14 (work in progress), March 2016.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
          Requirement Levels", BCP 14, RFC 2119,
          DOI 10.17487/RFC2119, March 1997,
          <http://www.rfc-editor.org/info/rfc2119>.

[RFC4657] Ash, J., Ed. and J. Le Roux, Ed., "Path Computation
          Element (PCE) Communication Protocol Generic
          Requirements", RFC 4657, DOI 10.17487/RFC4657, September
          2006, <http://www.rfc-editor.org/info/rfc4657>.

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

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