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PCEP Extensions for Bidirectional Forwarding Detection  
draft-li-pce-bfd-00

## Abstract

This document describes the extensions to the PCEP to notify BFD parameters for LSPs from PCE to PCC for PCE-initiated LSP. The extensions include BFD protocol parameters and allow PCC to support BFD for PCE-Initiated LSP whose BFD session is a bi-directional co-routed channel.

## 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 RFC 2119 [RFC2119].

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## 1. Introduction

RFC 5884 [RFC5884] describes the applicability of BFD in relation to LSP Ping for detecting rapidly a Multiprotocol Label Switching (MPLS) Label Switched Path (LSP) data plane failure. It also describes procedures for using BFD in MPLS environment. The LSP BFD detecting can be bidirectional LSP or unidirectional LSP (so long as there is some return path). If the path from ingress LSR to egress LSR is not co-routed with the path from egress LSR to ingress LSR, the failure to deliver BFD control packets from egress LSR to ingress LSR can lead to false negatives, making ingress LSR deduces that the LSP has failed.

I-D.ietf-pce-pce-initiated-lsp [I-D.ietf-pce-pce-initiated-lsp] introduces the procedure of PCE-initiated LSPs under the stateful PCE model. PCC will automatically set up the MPLS RSVP-TE LSP according to the explicit path PCE provides. BFD session for the PCE-initiated LSP can also be created dynamically and the return path is implicitly the shortest path. Such BFD session whose forward and reverse paths are possibly not co-routed has the same problem as mentioned above.

This document describes the extensions to the PCEP to notify BFD parameters for LSPs from PCE to PCC for PCE-initiated LSP. The extensions allow PCC to set up BFD session for PCE-Initiated LSP.

The BFD control packets can be exchanged over a bi-directional co-routed channel.

The BFD protocol parameters such as detection time multiplier, desired Min TX Interval, required Min RX Interval for PCE-initiated LSP come from the public template or global configuration on PCC. The extensions of PCEP include generic BFD protocol parameters too. It can be used to notify PCC by PCE to adjust these parameters for special LSP.

## 2. Terminology

BFD: Bidirectional Forwarding Detection

LSP: Label Switching Path

This document uses the following terms defined in RFC 5440 [RFC5440]: PCC, PCE, PCEP.

The following term is defined in I-D.ietf-pce-pce-initiated-lsp [I-D.ietf-pce-pce-initiated-lsp]:

PCE-initiated LSP: LSP that is instantiated as a result of a request from the PCE.

## 3. Bootstrapping Bi-directional Co-routed BFD Session

PCE computes the path for one LSP from the ingress LSR to egress LSR and initiates the creation of this LSP on ingress LSR. The LSP is called as LSP1. PCE can initiate the creation of LSP on egress LSR according to the co-routed path from egress LSR to ingress LSR. The LSP is called as LSP2.

To make the BFD session for LSP1 over the co-routed path to avoid the false detection there are two solutions as below:

### 3.1. Bootstrapping BFD session without LSP Ping

BFD for MPLS LSP uses LSP Ping carrying local discriminator to bootstrapping BFD session in order to associate the FEC representing the LSP with the BFD session indicated by discriminators. But PCE knows the two co-routed LSPs and can allocate the pair of discriminators for the co-routed LSPs.

PCE notify ingress LSR and egress LSR to set up BFD session for LSP1 by the BFD extensions of PCEP the pair of discriminators and notify PCC not necessary to send LSP ping message and directly to set up BFD

session. My discriminator in BFD control packets along LSP1 is your discriminator in BFD control packets along LSP2 and vice versa.

By this method the same BFD session is set up not only for LSP1 but also LSP2.

How to guarantee the discriminators allocated by PCE and PCC are not the same is out of scope of this document.

### 3.2. Bootstrapping BFD session with LSP Ping

I-D.ietf-mpls-bfd-directed [I-D.ietf-mpls-bfd-directed] defines the BFD Reverse Path TLV as an extension to LSP Ping RFC 4379 [RFC4379] and proposes that it to be used to instruct the egress BFD peer to use specified path for its BFD control packets associated with the particular BFD session.

After PCE initiates PCC to set up the LSP PCC delegates the MPLS RSVP-LSP with LSP-IDENTIFIERS TLV including FEC information to PCE. Therefore after ingress LSR and egress LSR set up the LSP1 and LSP2 independently they will delegate the LSP1 and LSP2 FEC information to PCE independently.

PCE notify ingress LSR to set up BFD session for LSP1 carrying the FEC information about the reverse LSP, LSP2. The information received by ingress LSR via PCEP can be set to the BFD Reverse Path TLV in the LSP Ping message. Following the procedure defined in [draft-ietf-mpls-bfd-directed-02] the BFD session would be a bi-directional co-routed channel and no false detection would be notified.

PCE notify Egress LSR to set up BFD session for LSP2 following the same process above.

By this method two BFD sessions are set up for LSP1 and LSP2 independently.

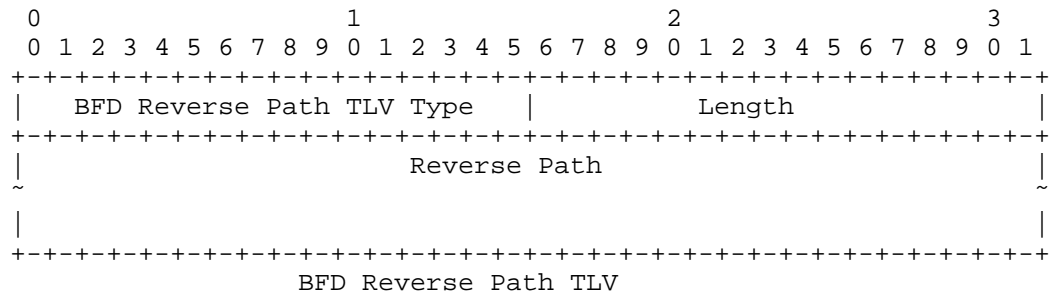
## 4. TLVs of PCEP Extensions for BFD

### 4.1. BFD Reverse Path TLV

The BFD Reverse Path TLV provides BFD parameters used to indicate the reverse path for BFD session.

This is an optional TLV defined for the LSPA Object. This TLV is included in the LSPA Object with PCUpd message.

The format of the BFD Reverse Path TLV is shown in the following figure:



BFD Reverse Path TLV Type is 2 octets in length and the value is to be assigned by IANA.

Length is 2 octets in length and defines the length in octets of the Reverse Path field.

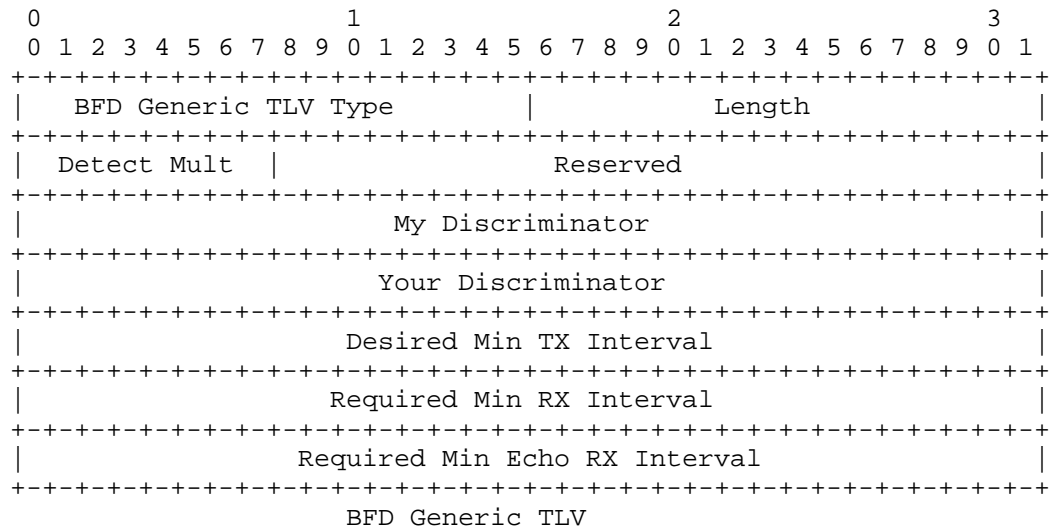
Reverse Path refers to Reverse Path defined in BFD Reverse Path TLV in I-D.ietf-mpls-bfd-directed [I-D.ietf-mpls-bfd-directed].

#### 4.2. BFD Generic TLV

The BFD Generic TLV provides BFD generic parameters of BFD session.

This is an optional TLV defined for the LSPA Object. This TLV is included in the LSPA Object with PCInitiate or PCUpd message.

The format of the BFD Generic TLV is shown in the following figure:



BFD Generic Path TLV Type is 2 octets in length and the value is to be assigned by IANA.

Length is 2 octets in length and defines the fixed length 20.

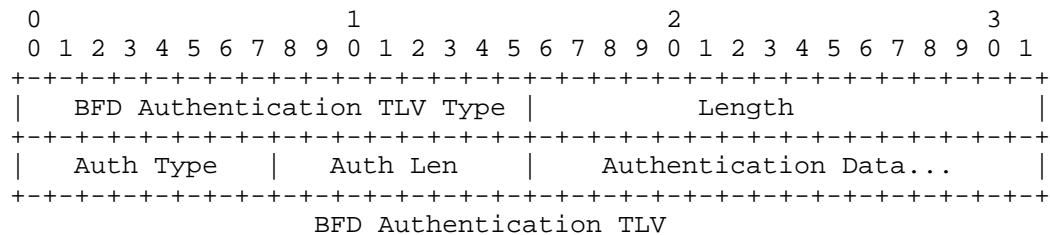
The value of TLV refers to Generic BFD Control Packet Format in RFC 5880 [RFC5880].

#### 4.3. BFD Authentication TLV

The BFD Authentication TLV provides BFD authentication parameters of BFD session.

This is an optional TLV defined for the LSPA Object. This TLV is included in the LSPA Object with PCInitiate or PCUpd message.

The format of the BFD Generic Path TLV is shown in the following figure:



BFD Authentication TLV Type is 2 octets in length and the value is to be assigned by IANA.

Length is 2 octets in length and defines the length in octets of the value of BFD Authentication TLV.

The value of TLV refers to the optional Authentication Section in RFC 5880 [RFC5880].

## 5. IANA Considerations

TBD.

## 6. Security Considerations

TBD.

## 7. Normative References

[I-D.ietf-mpls-bfd-directed]

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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, <<http://www.rfc-editor.org/info/rfc5440>>.

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