
Stream: Internet Engineering Task Force (IETF)
RFC: [10067](#)
Category: Standards Track
Published: October 2026
ISSN: 2070-1721
Authors:
C. Li, Ed. M. Chen W. Cheng R. Gandhi, Ed.
Huawei Technologies Huawei Technologies China Mobile Cisco Systems, Inc.
Q. Xiong
ZTE Corporation

RFC 10067

Path Computation Element Communication Protocol (PCEP) Extensions for Associated Bidirectional Segment Routing (SR) LSPs

Abstract

Segment Routing (SR) steers packets through a network using the IPv6 or MPLS data planes via source routing. Stateful Path Computation Element Communication Protocol (PCEP) extensions are defined for SR Traffic Engineering (TE) LSPs.

PCEP supports grouping two RSVP-TE signaled, unidirectional MPLS-TE Label-Switched Paths (LSPs) where a path in each direction in a network is grouped into an associated bidirectional LSP. This document extends PCEP support to group two unidirectional SR LSPs into an associated bidirectional SR LSP. The mechanisms defined in this document apply to both stateless and stateful PCEs for PCE-initiated and PCC-initiated LSPs.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <https://www.rfc-editor.org/info/rfc10067>.

Copyright Notice

Copyright (c) 2026 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Revised BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Revised BSD License.

Table of Contents

1. Introduction	3
2. Terminology	4
2.1. Requirements Language	4
3. Overview	4
3.1. PCE-Initiated Associated Bidirectional SR LSPs	4
3.2. PCC-Initiated Associated Bidirectional SR LSPs	6
4. PCEP Extensions	7
4.1. Bidirectional SR LSP Association Group	7
4.2. Bidirectional LSP Association Group TLV	8
4.3. PATH-ATTRIB Object	8
4.4. MULTIPATH-OPPDIR-PATH TLV	8
5. Additional PCEP Considerations	8
5.1. PLSP-ID Usage	8
5.2. Error Handling	9
6. Security Considerations	9
7. Operational Considerations	9
7.1. Control of Function and Policy	9
7.2. Information and Data Models	9
7.3. Liveness Detection and Monitoring	10
7.4. Verify Correct Operations	10

7.5. Requirements on Other Protocols	10
7.6. Impact on Network Operations	10
8. IANA Considerations	10
8.1. Association Type	10
9. References	10
9.1. Normative References	10
9.2. Informative References	12
Acknowledgments	13
Contributors	13
Authors' Addresses	14

1. Introduction

Segment Routing (SR) [RFC8402] can be used to steer packets through a network employing source routing. SR can be applied to both MPLS (SR-MPLS) and IPv6 (SRv6) data planes.

[RFC5440] describes the Path Computation Element (PCE) Communication Protocol (PCEP). [RFC8231] specifies a set of extensions to PCEP to enable stateful control of Traffic Engineering (TE) Label Switched Paths (LSPs) within and across PCEP sessions. As described in [RFC4655], a PCE can be either stateful or stateless. [RFC8664] specifies extensions to the PCEP for SR networks that allow a stateful PCE to compute and initiate SR TE paths, as well as a Path Computation Client (PCC) to request, report, or delegate them.

There are features such as directed Bidirectional Forwarding Detection (BFD) [RFC9612] and Performance Measurement [RFC9503] that require the ingress node (PCC) to be aware of the reverse direction SR path. For such features, the reverse SR paths need to be communicated to the ingress nodes (PCCs) using PCEP mechanisms. This allows both endpoint nodes to be aware of the forward and reverse SR paths.

An SR Policy [RFC9256] contains one or more Candidate Paths (CPs), which may be computed by a PCE. A Candidate Path of an SR Policy can contain one or more Segment Lists (SLs). In PCEP messages, an SL is encoded as an Explicit Route Object (ERO) as described in Section 4.3 of [RFC8664]. [RFC10066] defines PCEP extensions for carrying multiple SLs in the PCEP messages along with their opposite direction SLs, as described in Section 4.4 of [RFC10066].

As per [RFC8697], TE LSPs can be associated by adding them to a common association group by a PCEP peer. [RFC9059] uses the association group object to group two unidirectional RSVP-TE LSPs into an associated bidirectional LSP for both stateful and stateless PCE. This document extends this procedure and allows grouping two unidirectional SR LSPs into an associated bidirectional

SR LSP for co-routed [RFC9059] and non-co-routed paths. This extension also utilizes the procedure defined in [RFC10066] to carry the multiple EROs and the associated reverse path EROs for an SR LSP. Note that the association group and the procedure introduced in this document are specific to SR-TE and SRv6 Path Setup Types.

2. Terminology

The reader is assumed to be familiar with the terminology defined in [RFC8231], [RFC8281], [RFC8697], [RFC8408], [RFC9059], and [RFC10066].

This document uses the following terms defined in [RFC5440]:

Explicit Route Object (ERO), Path Computation Client (PCC), Path Computation Element (PCE), Path Computation Element Communication Protocol (PCEP), PCEP peer, and PCEP speaker.

This document extends the following term defined in [RFC3031]: Label Switched Path (LSP) - the base PCEP specification [RFC4655] originally defined the PCE architecture for MPLS and GMPLS networks with LSPs instantiated using the RSVP-TE signaling protocol. As specified in Section 2 of [RFC9603], the term "LSP" used in the PCEP specifications would be equivalent to an SRv6 path (represented as a list of SRv6 segments) in the context of supporting SRv6 in PCEP using the SRv6 Path Setup Type.

2.1. 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.

3. Overview

Associated bidirectional SR LSPs can be created and updated by a Stateful PCE or by a PCC as described in the subsections below for the case when there are no errors encountered and all operations are successful.

3.1. PCE-Initiated Associated Bidirectional SR LSPs

High-level steps for creating associated bidirectional SR LSPs by a Stateful PCE are shown in Figures 1 and 2.

- Step 1 - Stateful PCE Behavior:

Stateful PCE creates and updates the SR LSP and the associated reverse SR LSP EROs, for the "Bidirectional SR LSP Association" with the Association ID 1 on a PCC via PCInitiate and PCUpd messages, respectively.

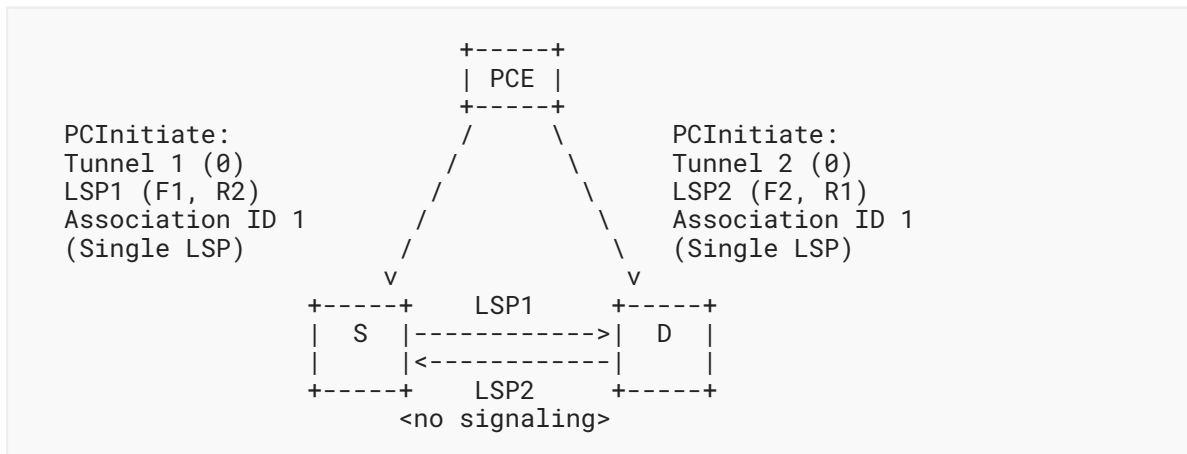


Figure 1: Step 1: PCE-Initiated Associated Bidirectional SR LSP with Forward-Direction LSPs and Reverse-Direction EROs

F1 and F2 = Forward LSP EROs

R1 and R2 = Reverse LSP EROs

0 = PLSP-ID

S = Source

D = Destination

• Step 2 - PCC Behavior:

The PCC, upon receiving the PCInitiate for the SR LSP and the associated reverse SR LSP EROs, locally assigns a PCEP-specific Identifier for the LSP (PLSP-ID) [RFC8231] and reports it to the PCE via a PCRpt message.

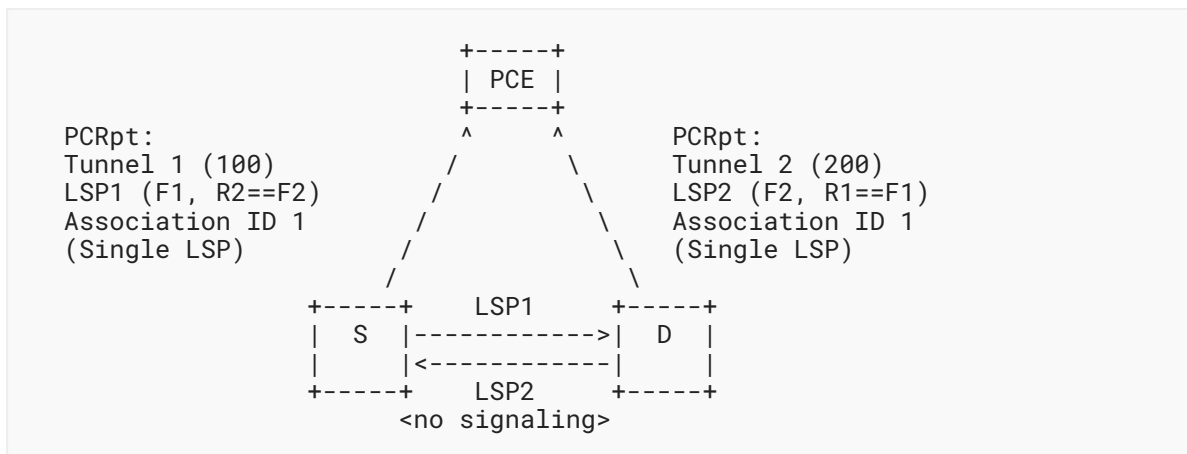


Figure 2: Step 2: PCC-Reported Bidirectional SR LSP with Forward-Direction LSPs and Reverse-Direction EROs

F1 and F2 = Forward LSP EROs

R1 and R2 = Reverse LSP EROs

100 and 200 = PLSP-IDs
S = Source
D = Destination

3.2. PCC-Initiated Associated Bidirectional SR LSPs

High-level steps for creating associated bidirectional SR LSPs by a PCC are shown in Figures 3 and 4.

- Step 1 - PCC Behavior:
PCC creates and updates an SR LSP for the "Bidirectional SR LSP Association" with the Association ID 2 and reports the change in the association group of an SR LSP to PCE(s) via a PCRpt message.

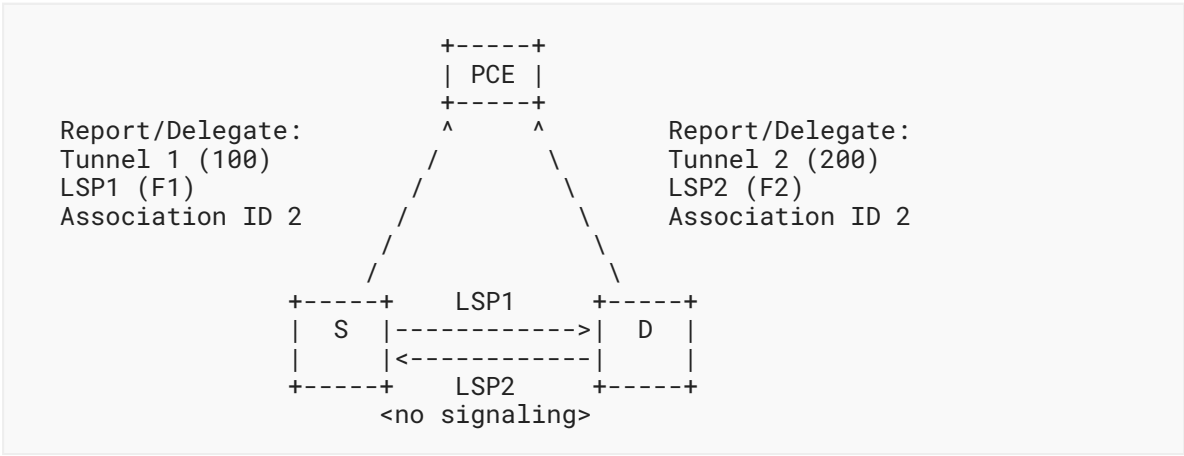


Figure 3: Step 1: PCC-Initiated Associated Bidirectional SR LSP with Forward-Direction LSP

F1 and F2 = Forward LSP EROs
100 and 200 = PLSP-IDs
S = Source
D = Destination

- Step 2 - Stateful PCE Behavior:
Stateful PCE updates the SR LSP and the associated reverse SR LSP EROs, for the "Bidirectional SR LSP Association" on a PCC via a PCUpd message.

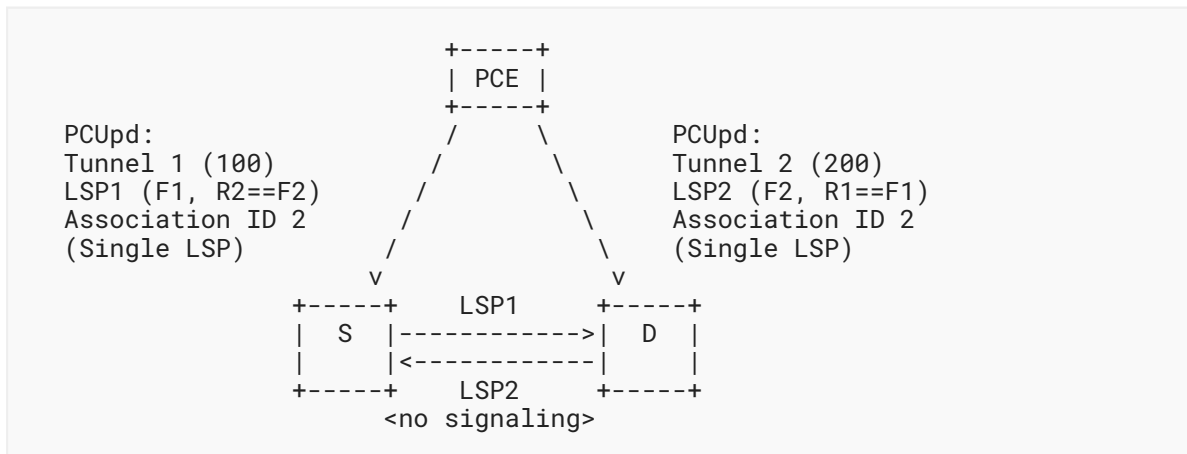


Figure 4: Step 2: PCE-Updated Associated Bidirectional SR LSP with Forward-Direction LSPs and Reverse-Direction EROs

F1 and F2 = Forward LSP EROs
 R1 and R2 = Reverse LSP EROs
 100 and 200 = PLSP-IDs
 S = Source
 D = Destination

4. PCEP Extensions

Two unidirectional SR LSPs (one in each direction between two nodes in a network) can be associated together by using the association group defined in this document for the PCEP messages and employing the procedures defined in [RFC9059] and [RFC10066].

4.1. Bidirectional SR LSP Association Group

For associating two unidirectional SR LSPs, this document defines a new Association Type called "Bidirectional SR LSP Association" for the Association Group object (Class-Value 40) as follows:

- Association Type (value 8) = Bidirectional SR LSP Association

The handling of the Association ID, Association Source, optional Global Association Source and optional Extended Association ID in this association are set as defined in [RFC8697].

[RFC8697] specifies the mechanism for the capability advertisement of the Association Types supported by a PCEP speaker by defining an ASSOC-Type-List TLV (value 35) to be carried within an OPEN object. The PCEP speaker **MUST** include the "Bidirectional SR LSP Association" type in the ASSOC-Type-List TLV and **MUST** receive the same from the PCEP peer before using it in the PCEP messages.

An SR LSP **MUST NOT** be part of more than one "Bidirectional SR LSP Association" on a PCE. A PCE, upon detecting this condition, **MUST NOT** send the associated reverse EROs to the ingress node PCC. This error condition **MUST** be logged and an alarm **MUST** be generated.

4.2. Bidirectional LSP Association Group TLV

A PCEP message for an associated bidirectional SR LSP **MAY** include the "Bidirectional LSP Association Group TLV" to indicate the co-routed path using the C flag defined in [Section 4.2](#) of [\[RFC9059\]](#).

As there is no reverse SR LSP instantiated, the Reverse LSP (R flag) **MUST NOT** be set for an associated bidirectional SR LSP and **MUST** be ignored. This error condition **MUST** be logged and an alarm **MUST** be generated.

4.3. PATH-ATTRIB Object

When a PCE informs an ingress node PCC about the associated reverse SR LSP EROs computed for an SR LSP with the "Bidirectional SR LSP Association", it **MUST** include the "PATH-ATTRIB" object with the Reverse (R flag) set to 1 to indicate that the ERO is for the reverse direction [\[RFC10066\]](#).

4.4. MULTIPATH-OPPDIR-PATH TLV

The PCE **MAY** include the "MULTIPATH-OPPDIR-PATH TLV" to indicate the co-routed path properties (in the N-flag and L-flag) for the reverse ERO [\[RFC10066\]](#) for an SR LSP.

The PCC **MUST** detect the mismatch between the co-routed path properties in the "MULTIPATH-OPPDIR-PATH TLV" for the reverse ERO and the co-routed path (C) flag in the "Bidirectional LSP Association Group TLV" for the (forward) SR LSP and log it as an error condition and generate an alarm.

5. Additional PCEP Considerations

Additional considerations for associating bidirectional SR LSPs are summarized in the subsections below.

5.1. PLSP-ID Usage

As per [\[RFC8231\]](#), an ingress node PCC reports a unique PLSP-ID for each LSP of an SR Policy. For an associated bidirectional SR LSP, the PCE will maintain two PLSP-IDs, one from the ingress node PCC and one from the egress node PCC. In the examples shown in [Figures 2](#) and [3](#), the ingress node PCC (node S) reports Tunnel 1, LSP1 to the PCE with PLSP-ID 100 whereas the egress node PCC (node D) reports Tunnel 2, LSP2 to the PCE with PLSP-ID 200.

5.2. Error Handling

The error handling as described in [Section 5.7](#) of [\[RFC9059\]](#) continues to apply for the "Bidirectional SR LSP Association".

The PCEP Path Setup Type (PST) for SR LSP uses either value "1: Traffic-engineering path is set up using Segment Routing" [\[RFC8664\]](#) or "3: Traffic engineering path is set up using SRv6" [\[RFC9603\]](#). If a PCEP speaker receives a non-SR LSP PST value for the "Bidirectional SR LSP Association", the PCEP speaker **MUST** return a PCErr message with Error-Type = 26 (Association Error) and Error-value = "16: Path Setup Type not supported" [\[RFC9059\]](#).

6. Security Considerations

The security considerations described in [\[RFC5440\]](#), [\[RFC8231\]](#), [\[RFC8281\]](#), [\[RFC8408\]](#), [\[RFC9059\]](#), and [\[RFC10066\]](#) apply to the extensions defined in this document as well.

A new Association Type for the Association object, "Bidirectional SR LSP Association", is introduced in this document. Additional security considerations related to LSP associations due to a malicious PCEP speaker are described in [\[RFC8697\]](#) and apply to this Association Type. Hence, securing the PCEP session using Transport Layer Security (TLS) [\[RFC8253\]](#), [\[RFC9916\]](#), as per the recommendations and best current practices in [\[RFC9325\]](#) is **RECOMMENDED**.

7. Operational Considerations

The manageability requirements and considerations listed in [\[RFC5440\]](#), [\[RFC8231\]](#), [\[RFC8281\]](#), [\[RFC8697\]](#), and [\[RFC10066\]](#) apply to the PCEP protocol extensions defined in this document. In addition, the operational requirements and considerations listed in this section apply.

7.1. Control of Function and Policy

The mechanisms defined in this document do not imply any new control or policy requirements.

7.2. Information and Data Models

[\[RFC7420\]](#) describes the PCEP MIB; there are no new MIB Objects defined for LSP associations.

The PCEP YANG module [\[RFC9826\]](#) defines a data model for LSP associations. However, it does not include information for associated bidirectional SR LSPs. It can be extended to include data related to the associated bidirectional SR LSPs, such as:

- Indication of whether the associated bidirectional SR LSPs are supported
- Enablement and disablement of the bidirectional SR LSP association
- Counters for the successfully associated bidirectional SR LSPs
- Counters for the SR LSPs that failed to form a bidirectional association

7.3. Liveness Detection and Monitoring

Mechanisms defined in this document do not imply any new liveness detection and monitoring requirements as they are performed independently on both sides of a bidirectional SR LSP, using the forward and reverse LSP paths of the bidirectional SR LSP. However, the monitoring on both sides of a bidirectional SR LSP needs to be correlated at the management level to ensure that the bidirectional service carried by the bidirectional SR LSP is operational.

7.4. Verify Correct Operations

Mechanisms defined in this document do not imply any new operation verification requirements.

7.5. Requirements on Other Protocols

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

7.6. Impact on Network Operations

Associating two SR LSPs to form an associated bidirectional SR LSP requires an operator to ensure that the correct LSP associations are employed on both sides of the bidirectional SR LSP. Tools such as directed BFD [RFC9612] and Performance Measurement [RFC9503] can be used to verify the correct operation of a bidirectional SR LSP.

8. IANA Considerations

8.1. Association Type

IANA has registered the following Association Type for the Association Group object (Class-Value 40) in the "ASSOCIATION Type Field" registry [RFC8697] within the "Path Computation Element Protocol (PCEP) Numbers" registry group (see <<https://www.iana.org/assignments/pcep/>>):

Type	Name	Reference
8	Bidirectional SR LSP Association	RFC 10067

Table 1

9. References

9.1. Normative References

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

-
- [RFC3031] Rosen, E., Viswanathan, A., and R. Callon, "Multiprotocol Label Switching Architecture", RFC 3031, DOI 10.17487/RFC3031, January 2001, <<https://www.rfc-editor.org/info/rfc3031>>.
- [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>>.
- [RFC8253] Lopez, D., Gonzalez de Dios, O., Wu, Q., and D. Dhody, "PCEPS: Usage of TLS to Provide a Secure Transport for the Path Computation Element Communication Protocol (PCEP)", RFC 8253, DOI 10.17487/RFC8253, October 2017, <<https://www.rfc-editor.org/info/rfc8253>>.
- [RFC8281] Crabbe, E., Minei, I., Sivabalan, S., and R. Varga, "Path Computation Element Communication Protocol (PCEP) Extensions for PCE-Initiated LSP Setup in a Stateful PCE Model", RFC 8281, DOI 10.17487/RFC8281, December 2017, <<https://www.rfc-editor.org/info/rfc8281>>.
- [RFC8402] Filsfils, C., Ed., Previdi, S., Ed., Ginsberg, L., Decraene, B., Litkowski, S., and R. Shakir, "Segment Routing Architecture", RFC 8402, DOI 10.17487/RFC8402, July 2018, <<https://www.rfc-editor.org/info/rfc8402>>.
- [RFC8408] Sivabalan, S., Tantsura, J., Minei, I., Varga, R., and J. Hardwick, "Conveying Path Setup Type in PCE Communication Protocol (PCEP) Messages", RFC 8408, DOI 10.17487/RFC8408, July 2018, <<https://www.rfc-editor.org/info/rfc8408>>.
- [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>>.
- [RFC8697] Minei, I., Crabbe, E., Sivabalan, S., Ananthakrishnan, H., Dhody, D., and Y. Tanaka, "Path Computation Element Communication Protocol (PCEP) Extensions for Establishing Relationships between Sets of Label Switched Paths (LSPs)", RFC 8697, DOI 10.17487/RFC8697, January 2020, <<https://www.rfc-editor.org/info/rfc8697>>.
- [RFC9059] Gandhi, R., Ed., Barth, C., and B. Wen, "Path Computation Element Communication Protocol (PCEP) Extensions for Associated Bidirectional Label Switched Paths (LSPs)", RFC 9059, DOI 10.17487/RFC9059, June 2021, <<https://www.rfc-editor.org/info/rfc9059>>.
-

- [RFC9256] Filsfils, C., Talaulikar, K., Ed., Voyer, D., Bogdanov, A., and P. Mattes, "Segment Routing Policy Architecture", RFC 9256, DOI 10.17487/RFC9256, July 2022, <<https://www.rfc-editor.org/info/rfc9256>>.
- [RFC9325] Sheffer, Y., Saint-Andre, P., and T. Fossati, "Recommendations for Secure Use of Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS)", BCP 195, RFC 9325, DOI 10.17487/RFC9325, November 2022, <<https://www.rfc-editor.org/info/rfc9325>>.
- [RFC9603] Li, C., Ed., Kaladharan, P., Sivabalan, S., Koldychev, M., and Y. Zhu, "Path Computation Element Communication Protocol (PCEP) Extensions for IPv6 Segment Routing", RFC 9603, DOI 10.17487/RFC9603, July 2024, <<https://www.rfc-editor.org/info/rfc9603>>.
- [RFC9916] Dhody, D., Turner, S., and R. Housley, "Updates to the Usage of TLS to Provide a Secure Transport for the Path Computation Element Communication Protocol (PCEP)", RFC 9916, DOI 10.17487/RFC9916, July 2026, <<https://www.rfc-editor.org/info/rfc9916>>.
- [RFC10066] Koldychev, M., Ed. and S. Sidor, Ed., "Path Computation Element Communication Protocol (PCEP) Extensions for Signaling Multipath Information", RFC 10066, DOI 10.17487/RFC10066, October 2026, <<https://www.rfc-editor.org/info/rfc10066>>.

9.2. Informative References

- [RFC4655] Farrel, A., Vasseur, J.-P., and J. Ash, "A Path Computation Element (PCE)-Based Architecture", RFC 4655, DOI 10.17487/RFC4655, August 2006, <<https://www.rfc-editor.org/info/rfc4655>>.
- [RFC7420] Koushik, A., Stephan, E., Zhao, Q., King, D., and J. Hardwick, "Path Computation Element Communication Protocol (PCEP) Management Information Base (MIB) Module", RFC 7420, DOI 10.17487/RFC7420, December 2014, <<https://www.rfc-editor.org/info/rfc7420>>.
- [RFC9503] Gandhi, R., Ed., Filsfils, C., Chen, M., Janssens, B., and R. Foote, "Simple Two-Way Active Measurement Protocol (STAMP) Extensions for Segment Routing Networks", RFC 9503, DOI 10.17487/RFC9503, October 2023, <<https://www.rfc-editor.org/info/rfc9503>>.
- [RFC9612] Mirsky, G., Tantsura, J., Varlashkin, I., and M. Chen, "Bidirectional Forwarding Detection (BFD) Reverse Path for MPLS Label Switched Paths (LSPs)", RFC 9612, DOI 10.17487/RFC9612, July 2024, <<https://www.rfc-editor.org/info/rfc9612>>.
- [RFC9826] Dhody, D., Ed., Beeram, V., Hardwick, J., and J. Tantsura, "A YANG Data Model for the Path Computation Element Communication Protocol (PCEP)", RFC 9826, DOI 10.17487/RFC9826, September 2025, <<https://www.rfc-editor.org/info/rfc9826>>.

Acknowledgments

Many thanks to Marina Fizgeer, Adrian Farrel, Andrew Stone, Tarek Saad, Samuel Sidor, and Mike Koldychev for the detailed review of this document and for providing many useful comments. Also, thank you, John Scudder, for the RtgDir Early review, Carlos Pignataro for the OpsDir review, Dhruv Dhody for the Shepherd review, Ketan Talaulikar for the WG AD review, Meral Shirazipour for Genart review, and Mohamed Boucadair, Éric Vyncke, Deb Cooley, Mahesh Jethanandani, Mike Bishop, and Gunter Van de Velde for the IESG review, which helped improve this document.

Contributors

The following people have substantially contributed to this document:

Dhruv Dhody

Huawei Technologies
Divyashree Techno Park, Whitefield
Bangalore 560066
Karnataka
India
Email: dhruv.ietf@gmail.com

Zhenbin Li

Huawei Technologies
Huawei Campus, No. 156 Beiqing Rd.
Beijing
100095
China
Email: lizhenbin@huawei.com

Jie Dong

Huawei Technologies
Huawei Campus, No. 156 Beiqing Rd.
Beijing
100095
China
Email: jie.dong@huawei.com

Authors' Addresses

Cheng Li (EDITOR)

Huawei Technologies
Huawei Campus, No. 156 Beiqing Rd.
Beijing
100095
China
Email: c.l@huawei.com

Mach(Guoyi) Chen

Huawei Technologies
Huawei Campus, No. 156 Beiqing Rd.
Beijing
100095
China
Email: mach.chen@outlook.com

Weiqiang Cheng

China Mobile
China
Email: chengweiqiang@chinamobile.com

Rakesh Gandhi (EDITOR)

Cisco Systems, Inc.
Canada
Email: rgandhi@cisco.com

Quan Xiong

ZTE Corporation
China
Email: xiong.quan@zte.com.cn