



IETF 124 – Online
PCE Working Group

PCEP Extensions for Signaling Multipath Information

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Motivation

- Existing PCEP RFCs are limited to a single path (ERO) per LSP, which is not sufficient for modern TE requirements.
- **SR Policy with Multiple Segment Lists**
 - An SR Policy Candidate Path often uses multiple Segment Lists for ECMP/W-ECMP. This draft enables signaling them together.
- **Bandwidth Splitting (W-ECMP)**
 - Allows a PCE to satisfy a large bandwidth request by splitting traffic across multiple weighted paths.
- **Reverse Path Association**
 - Maps individual forward paths to their reverse paths, which is critical for applications like Circuit Style SR Policy (CS-SR) that require co-routed BFD/PM sessions.

The Solution: The PATH-ATTRIB Object

- Introduced PATH-ATTRIB object as the core mechanism. It acts as a container for path-specific attributes and precedes each ERO/RRO.
- **Key PATH-ATTRIB TLVs**
 - MULTIPATH-WEIGHT: Enables Weighted ECMP by assigning a weight to each path.
 - MULTIPATH-BACKUP: Associates primary paths with backup paths for protection at the Segment List level.
 - MULTIPATH-OPPDIR-PATH: Maps a path to its opposite-direction counterpart using a Path ID, with flags for co-routing.
 - Support is negotiated via a new **MULTIPATH-CAP TLV** in the OPEN message.
- **Message Structure Update**
 - `<intended-path> ::= (<PATH-ATTRIB><ERO>) [<intended-path>]`

Example: SR Policy with Two Segment Lists

SR Policy Definition

SR Policy POL1

Candidate Path CP1

Weight W1, SID-List1 <SID11...SID1i>

Weight W2, SID-List2 <SID21...SID2j>

PCEP Encoding

<PCRpt>

<LSP>

...

<PATH-ATTRIB Path-ID=1>

<MULTIPATH-WEIGHT TLV Weight=W1>

<ERO SID-List1>

<PATH-ATTRIB Path-ID=2>

<MULTIPATH-WEIGHT TLV Weight=W2>

<ERO SID-List2>

Support for Composite CP & Per-Flow Policies

- **Composite Candidate Path**

- Instead of an ERO, a path recursively steers traffic to another SR Policy.
- The PATH-ATTRIB object contains a COLOR TLV to identify the downstream policy.

- **Per-Flow Candidate Path**

- Builds on Composite CPs by adding a MULTIPATH-FORWARD-CLASS TLV.
- Allows steering different classes of traffic (e.g., based on QoS) to different downstream SR Policies.

Next steps

- The draft is stable and has been implemented by multiple vendors.
- We are seeking any **final comments or feedback**.
- Reduce number of authors to 5