PCEP Extensions for Signaling Multipath Information

M. Koldychev – Cisco Systems (mkoldych@cisco.com) – Presenter
M. Sivabalan – Cisco Systems (msiva@cisco.com)
T. Saad – Juniper (tsaad@juniper.net)
V. Beeram – Juniper (vbeeram@juniper.net)
H. Bidgoli – Nokia (Hooman.Bidgoli@Nokia.com)
B. Yadav – Ciena (byadav@ciena.com)

Motivation

1. Signaling Multiple Segment-Lists of an SR Candidate-Path

   ```
   SR policy POL1 <headend, color, endpoint>
     Candidate-path CP1 <proto, originator, discriminator>
       Weight W1, SID-List1 <SID11...SID1i>
       Weight W2, SID-List2 <SID21...SID2j>
   ```

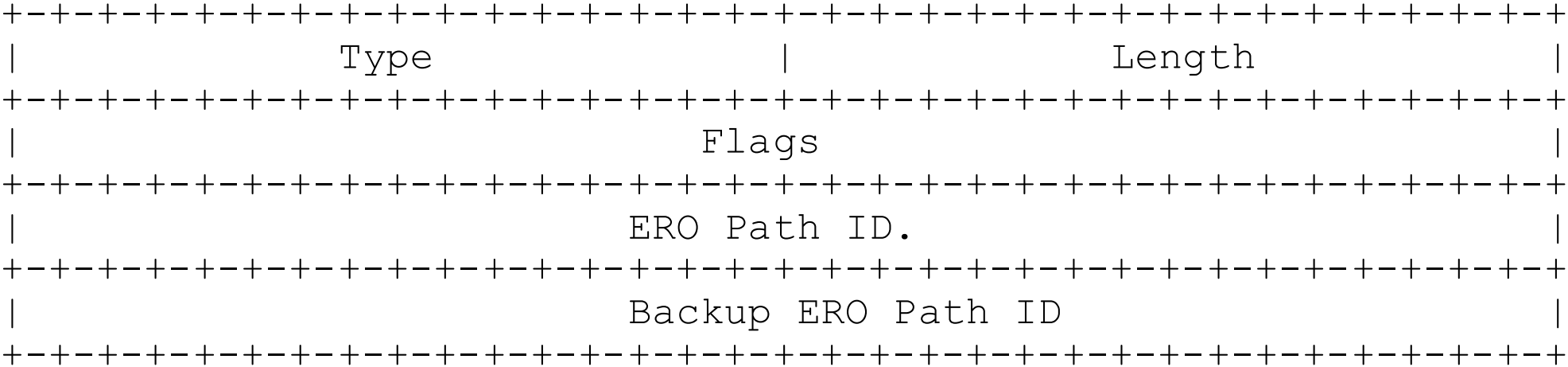2. Splitting of Requested Bandwidth

   - request a path with 100 Gbit of bandwidth, but all available links in the network have only 50 Gbit capacity

3. Providing Backup ERO for Protection

   - allow paths to protect each other in case of failure

Multipaths

We include multiple ERO objects within the same PCEP LSP, rather than creating multiple PCEP LSPs and associating them. This gives the desirable property that a single PCRpt/PCUpd/PCInit carries all the forwarding information in a single shot.

We introduce a new object, ERO-ATTRIBUTES:

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            Flags                      | Oper|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                         Optional TLVs                        ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

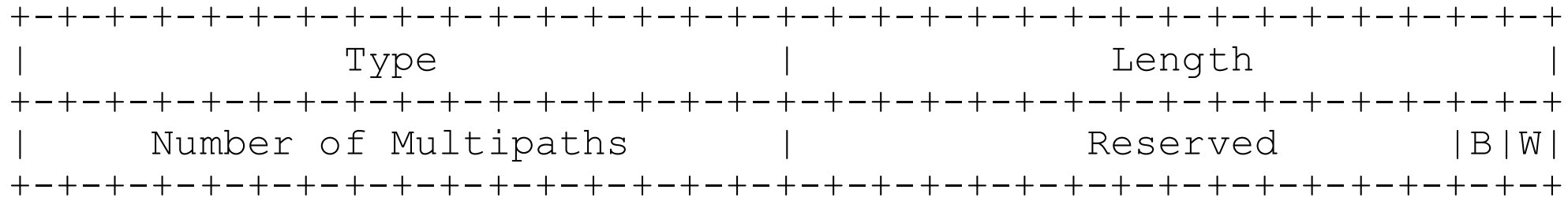Optional TLVs can encode additional attributes/state about the path, such as weight for UCMP, protection, etc.

Protection

We allow EROs to protect each other in various combinations. For this purpose, we introduce the MULTIPATH-BACKUP TLV:

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                   Type                   |              Length              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             Flags                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                          ERO Path ID.                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Backup ERO Path ID                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

We plan to extend this TLV in the next revision to allow for more rich protection scenarios.

Capability

PCC needs specify how many multipaths it is able to install in forwarding. For this, we introduce the MULTIPATH-CAP TLV:

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Type                 |              Length               |   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Number of Multipaths       |                Reserved            |B|W|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

This TLV is mandatory in the OPEN object (if the PCC/PCE supports this draft), but can also be optionally carried in the LSP object to override the global values. For example, if a given Tunnel specifically does not want multipaths, it can set the Number of Multipaths to 1.