Label Switched Path (LSP) Object Flag Extension of Stateful PCE

Abstract

RFC 8231 describes a set of extensions to Path Computation Element
Communication Protocol (PCEP) to enable stateful control of MPLS-TE
and GMPLS Label Switched Paths (LSPs) via PCEP. One of the
extensions is the LSP object which includes a Flag field of the
length of 12 bits. However, all bits of the Flag field have already
been assigned in RFC 8231, RFC 8281, RFC 8623 and I-D.ietf-pce-
binding-label-sid.

[Note to RFC Editor - Replace I-D.ietf-pce-binding-label-sid to RFC
XXXX, once the RFC number is assigned.]

This document proposes to define a new LSP-EXTENDED-FLAG TLV for the
LSP object for an extended flag field.

Status of This Memo

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Table of Contents

1. Introduction

   [RFC5440] describes the Path Computation Element (PCE) Communication
   Protocol (PCEP) which is used between a PCE and a Path Computation
   Client (PCC) (or other PCE) to enable computation of Multi-protocol
   Label Switching (MPLS) for Traffic Engineering Label Switched Path
   (TE LSP).

   PCEP Extensions for the Stateful PCE Model [RFC8231] describes a set
   of extensions to PCEP to enable active control of MPLS-TE and
   Generalized MPLS (GMPLS) tunnels. One of the extensions is the LSP
   object which contains a flag field; bits in the flag field are used
   to indicate delegation, synchronization, removal, etc.

As defined in [RFC8231], the length of the flag field is 12 bits and the value from bit 5 to bit 11 is used for operational, administrative, remove, synchronize and delegate bits respectively. The bit value 4 is assigned in [RFC8281] for create for PCE-Initiated LSPs. The bits from 1 to 3 is assigned in [RFC8623] for Explicit Route Object (ERO)-compression, fragmentation and Point-to-Multipoint (P2MP) respectively. The bit 0 is assigned in [I-D.ietf-pce-binding-label-sid] to PCE-allocation. All bits of the Flag field has been assigned already. Thus, it is required to extend the flag field for the LSP Object for future use.

This document proposes to define a new LSP-EXTENDED-FLAG TLV for an extended flag field in the LSP object.

2. Conventions used in this document

2.1. Terminology

The terminology is defined as [RFC5440] and [RFC8231].

2.2. 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. PCEP Extension

The LSP Object is defined in Section 7.3 of [RFC8231]. This document proposes to define a new LSP-EXTENDED-FLAG TLV for an extended flag field in the LSP object.

3.1. The LSP-EXTENDED-FLAG TLV

The format of the LSP-EXTENDED-FLAG TLV follows the format of all PCEP TLVs as defined in [RFC5440] and is shown in the Figure 1.

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           Type=TBD1           |            Length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
//                    LSP Extended Flags                       //
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
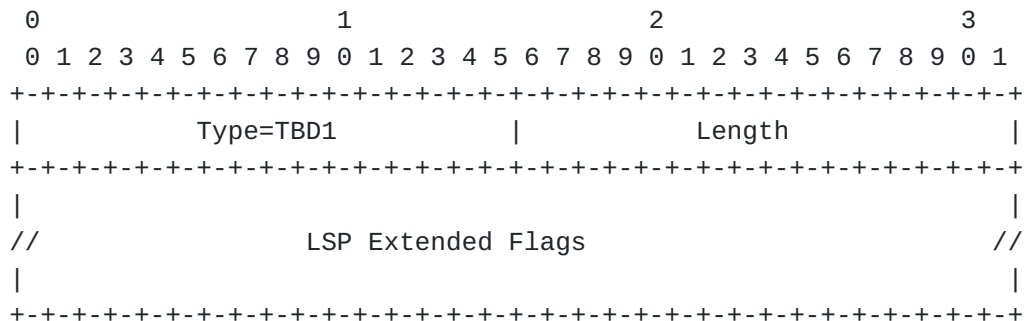
Figure 1: Figure 1: LSP-EXTENDED-FLAG TLV Format

Type (16 bits): the value is TBD1 by IANA.

Length (16 bits): multiple of 4 octets.

LSP Extended Flags: this contains an array of units of 32-bit flags
numbered from the most significant as bit zero, where each bit
represents one LSP flag (for operation, feature, or state).
Currently no bits are assigned. Unassigned bits MUST be set to zero
on transmission and MUST be ignored on receipt.

As an example of usage of the LSP-EXTENDED-FLAG TLV, the E-flag is
requested for entropy label configuration as proposed in [I-D.peng-
pce-entropy-label-position].

3.2. Processing

The LSP Extended Flags field is an array of units of 32 flags and to
be allocated starting from the most significant bit. No bits are
currently assigned in this document and the bits of the LSP Extended
Flags field will be assigned by future documents.

Note that, PCEP peers MAY encounter different length of the LSP-
EXTENDED-FLAG TLV.

If a PCEP speaker receives the LSP-EXTENDED-FLAG TLV of a length
more than it currently supports or understands, it will simply
ignore the bits beyond that length.

If a PCEP speaker receives the LSP-EXTENDED-FLAG TLV of a length
less than the one supported by the implementation, it will consider
the bits beyond the length to be unset.

4. Backward Compatibility

The LSP-EXTENDED-FLAG TLV defined in this document does not
introduce any interoperability issues.

A router that does not understand or support the LSP-EXTENDED-FLAG
TLV will silently ignore the TLV as per [RFC5440]. It is expected
that future document that define bits in the LSP-EXTENDED-FLAG TLV
would also define the error case handling required for missing LSP-
EXTENDED-FLAG TLV if it MUST be present.

5. IANA Considerations

5.1. LSP Object

5.1.1. PCEP TLV Type Indicators

IANA is requested to allocate the following TLV Type Indicator value within the "PCEP TLV Type Indicators" subregistry of the "Path Computation Element Protocol (PCEP) Numbers" registry:

Value	Description	Reference
TBD1	LSP-EXTENDED-FLAG	[This document]

Table 1

5.1.2. LSP Extended Flags Field

IANA is requested to create a new subregistry called "LSP-EXTENDED-FLAG TLV Flag Field", within the "Path Computation Element Protocol (PCEP) Numbers" registry to manage the LSP Extended Flags field of the LSP-EXTENDED-FLAG TLV. New values are assigned by Standards Action [RFC8126]. Each bit should be tracked with the following qualities:

  *Bit number (counting from bit 0 as the most significant bit)

  *Capability description

  *Defining RFC

No values are currently defined.

6. Implementation Status

[NOTE TO RFC EDITOR : This whole section and the reference to [RFC7942] is to be removed before publication as an RFC]

This section records the status of known implementations of the protocol defined by this specification at the time of posting of this Internet-Draft, and is based on a proposal described in [RFC7942]. The description of implementations in this section is intended to assist the IETF in its decision processes in progressing drafts to RFCs. Please note that the listing of any individual implementation here does not imply endorsement by the IETF. Furthermore, no effort has been spent to verify the information presented here that was supplied by IETF contributors. This is not intended as, and must not be construed to be, a catalog of available implementations or their features. Readers are advised to note that other implementations may exist.

According to [RFC7942], "this will allow reviewers and working groups to assign due consideration to documents that have the benefit of running code, which may serve as evidence of valuable experimentation and feedback that have made the implemented protocols more mature. It is up to the individual working groups to use this information as they see fit".

At the time of posting this version of this document, there are no known implementations of this TLV. It is believed that this would be implemented along side the documents that allocate flags in the TLV.

7. Management Considerations

Implementations receiving set LSP Extended Flags that they do not recognize MAY log this. That could be helpful for diagnosing backward compatibility issues with future features that utilize those flags.

8. Security Considerations

[RFC8231] sets out security considerations for PCEP when used for communication with a stateful PCE. This document does not change those considerations. For LSP Object processing, see [RFC8231].

This document provides for future extension of PCEP. No additional security issues are raised in this document beyond those that exist in the referenced documents.

9. Acknowledgements

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11.1. Normative References

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11.2. Informative References

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Appendix A. WG Discussion

The WG discussed the idea of a fixed length (with 32 bits) for LSP-
EXTENDED-FLAG TLV. Though 32 bits would be sufficient for quite a
while, the use of variable length with a multiple of 32-bits allows
for future extensibility where we would never run out of flags and
there would not be a need to define yet another TLV in the future.
Further, note that [RFC5088] and [RFC5089] use the same approach for
the PCE-CAP-FLAGS Sub-TLV and are found to be useful.

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