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RFC 9792
Prefix Flag Extension for OSPFv2 and OSPFv3

Abstract

Each OSPF prefix can be advertised with an 8-bit field to indicate specific properties of that prefix. However, all the OSPFv3 Prefix Options bits have already been assigned, and only a few bits remain unassigned in the Flags field of the OSPFv2 Extended Prefix TLV.

This document solves this problem by defining a variable-length Prefix Extended Flags sub-TLV for OSPF. This sub-TLV is applicable to OSPFv2 and OSPFv3.

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/rfc9792.

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1. Introduction

Each OSPF prefix can be advertised with an 8-bit field to indicate specific properties of that prefix. This is done using the OSPFv3 Prefix Options (Appendix A.4.1.1 of [RFC5340]) and the Flags field in the OSPFv2 Extended Prefix TLV (Section 2.1 of [RFC7684]). The rest of this document refers to these 8-bit fields in both OSPFv2 and OSPFv3 as the "existing fixed-size prefix flags".

However, all the OSPFv3 Prefix Options bits have already been assigned (see the "OSPFv3 Prefix Options (8 bits)" IANA registry [IANA-OSPFv3-PO]). Also, at the time of publication of this document, only 5 bits remain unassigned in the Flags field of the OSPFv2 Extended Prefix TLV (see the "OSPFv2 Extended Prefix TLV Flags" IANA registry [IANA-OSPFv2-EPF]).

This document solves the problem of insufficient flag bits for the signaling of prefix properties in OSPF by defining a variable-length Prefix Extended Flags sub-TLV for OSPFv2 and OSPFv3.

1.1. 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.

2. Variable-Length Prefix Extended Flags Sub-TLV

This document defines a variable-length Prefix Extended Flags sub-TLV for OSPFv2 and OSPFv3. The sub-TLV specifies the variable-length Prefix Extended Flags field to advertise additional attributes associated with OSPF prefixes. The advertisement and processing of the existing fixed-size prefix flags remain unchanged.

The format of the OSPFv2/OSPFv3 Prefix Extended Flags sub-TLV is shown in Figure 1.
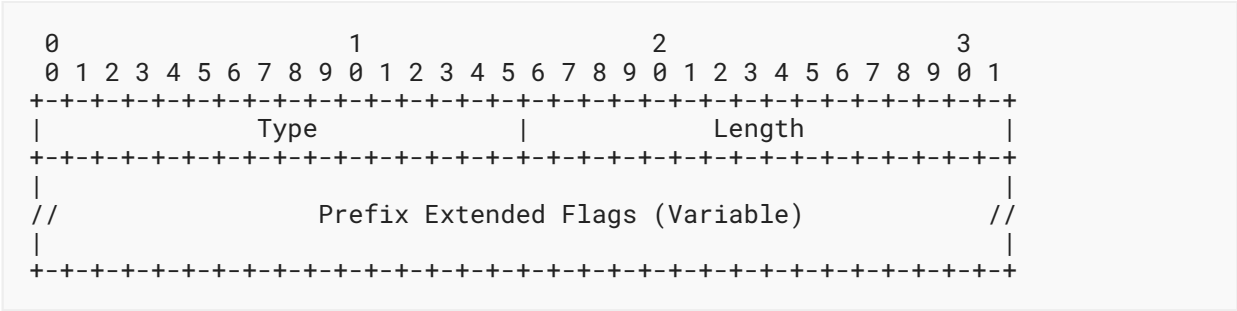
```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Type              |            Length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
//              Prefix Extended Flags (Variable)              //
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 1: Format of OSPFv2/OSPFv3 Prefix Extended Flags Sub-TLV

where:

Type (2 octets):   11 for OSPFv2 and 37 for OSPFv3

Length (2 octets):   Variable, dependent on the included Prefix Extended Flags field. This indicates the length of the Prefix Extended Flags field in octets. The length **MUST** be a multiple of 4 octets. If the length is not a multiple of 4 octets, the Link State Advertisement (LSA) is malformed and **MUST** be ignored.

Prefix Extended Flags (Variable):   The extended flag field. This field contains a variable number of flags, grouped in 4-octet blocks. The bits are numbered starting from bit 0 as the most significant bit of the first 32-bit block. If the length of the Prefix Extended Flags field exceeds 4 octets, numbering for the additional bits picks up where the previous 4-octet block left off. For example, the most significant bit in the fifth octet of an 8-octet Prefix Extended Flags field is referred to as bit 32. Currently, no bits are defined in this document.

Unassigned bits **MUST** be set to zero on transmission and **MUST** be ignored on receipt.

An implementation **MUST** limit the length of the sub-TLV so as to signal the bits that are set to 1. Defined prefix flags that are not transmitted due to being beyond the transmitted length **MUST** be treated as being set to 0.

The OSPFv2 Prefix Extended Flags sub-TLV is advertised as a sub-TLV of the OSPFv2 Extended Prefix TLV defined in [RFC7684]. Additional OSPFv2 prefix flags **SHOULD** be allocated from the unused bits in the Flags field of the OSPFv2 Extended Prefix TLV prior to allocating flags in the OSPFv2 Prefix Extended Flags sub-TLV.

The OSPFv3 Prefix Extended Flags sub-TLV is advertised as a sub-TLV of the following OSPFv3 TLVs:

- Inter-Area-Prefix TLV (Section 3.4 of [RFC8362])
- External-Prefix TLV (Section 3.6 of [RFC8362])
- Intra-Area-Prefix TLV (Section 3.7 of [RFC8362])
- SRv6 Locator TLV [RFC9513]

When multiple instances of the OSPFv2/OSPFv3 Prefix Extended Flags sub-TLVs are received within the same TLV, an implementation **MUST** use only the first occurrence of the sub-TLV and **MUST** ignore all subsequent instances of the sub-TLV. Errors **SHOULD** be logged subject to rate limiting.

3. Backward Compatibility

The OSPFv2/OSPFv3 Prefix Extended Flags sub-TLV does not introduce any backward compatibility issues. An implementation that does not recognize the OSPFv2/OSPFv3 Prefix Extended Flags sub-TLV would ignore the sub-TLV as per normal TLV processing operations (refer to Section 2.3.2 of [RFC3630] and Section 6.3 of [RFC8362]).

4. IANA Considerations

4.1. OSPFv2

4.1.1. OSPFv2 Prefix Extended Flags Sub-TLV

IANA has allocated the following codepoint in the "OSPFv2 Extended Prefix TLV Sub-TLVs" registry:

Value	Description	Reference
11	OSPFv2 Prefix Extended Flags	RFC 9792

Table 1

4.1.2. OSPFv2 Prefix Extended Flags Registry

IANA has created the "OSPFv2 Prefix Extended Flags" registry within the "Open Shortest Path First v2 (OSPFv2) Parameters" registry group. The registry defines the bits in the Prefix Extended Flags field in the OSPFv2 Prefix Extended Flags sub-TLV as specified in Section 2. The bits are to be allocated via IETF Review [RFC8126]. Each bit definition will include:

- Bit number (counting from bit 0 as the most significant bit of the first block)
- Description
- Reference

No bits are currently defined. Bits 0-31 are to be initially marked as "Unassigned". The flags defined in this document may use either a single bit or multiple bits to represent a state, as determined by the specific requirements of the document defining them. IANA will add subsequent blocks of 32 bits upon exhaustion of the preceding 32-bit block.

4.2. OSPFv3

4.2.1. OSPFv3 Prefix Extended Flags Sub-TLV

IANA has allocated the following codepoint in the "OSPFv3 Extended-LSA Sub-TLVs" registry:

Value	Description	L2BM	Reference
37	OSPFv3 Prefix Extended Flags	X	RFC 9792

Table 2

4.2.2. OSPFv3 Prefix Extended Flags Registry

IANA has created the "OSPFv3 Prefix Extended Flags" registry within the "Open Shortest Path First v3 (OSPFv3) Parameters" registry group. The registry defines the bits in the Prefix Extended Flags field in the OSPFv2 Prefix Extended Flags sub-TLV as specified in Section 2. The bits are to be allocated via IETF Review [RFC8126]. Each bit definition will include:

- Bit number (counting from bit 0 as the most significant bit of the first block)
- Description
- Reference

No bits are currently defined. Bits 0-31 are to be initially marked as "Unassigned". The flags defined in this document may use either a single bit or multiple bits to represent a state, as determined by the specific requirements of the document defining them. IANA will add subsequent blocks of 32 bits upon exhaustion of the preceding 32-bit block.

5. Security Considerations

Procedures and protocol extensions defined in this document do not affect the OSPFv2 or OSPFv3 security models. See Section 5 of [RFC7684] for a discussion of OSPFv2 TLV-encoding considerations and Section 7 of [RFC8362] for a discussion of OSPFv3 security.

6. References

6.1. 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>.

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6.2. Informative References

[IANA-OSPFv2-EPF]   IANA, "OSPFv2 Extended Prefix TLV Flags", <https://www.iana.org/assignments/ospfv2-parameters>.

[IANA-OSPFv3-PO]   IANA, "OSPFv3 Prefix Options (8 bits)", <https://www.iana.org/assignments/ospfv3-parameters>.

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